Metal Finishing

POLISHING AND BUFFING · BARREL FINISHING · CLEANING
PLATING · ANODIZING · RUST PROOFING · LACQUERING & ENAMELING

SEPTEMBER, 1958

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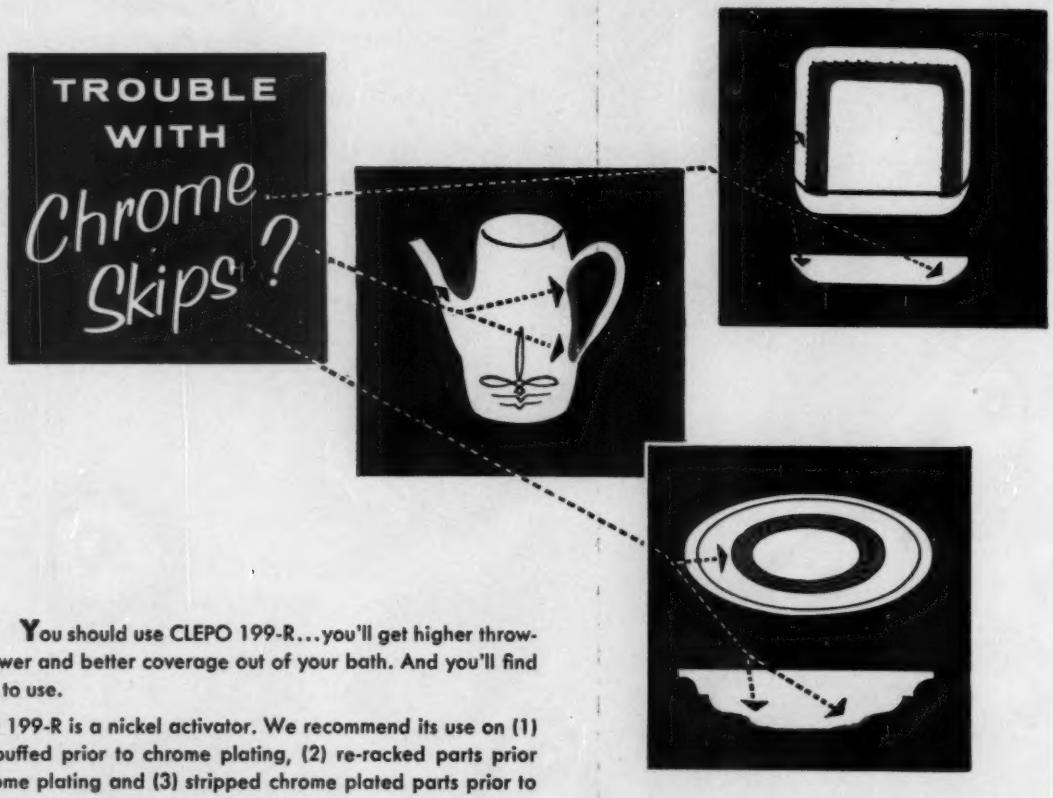
Read and pass on—

LIBRARY OF CLEPO SERVICE

199-R



You should use CLEPO 199-R...you'll get higher throwing power and better coverage out of your bath. And you'll find it easy to use.

CLEPO 199-R is a nickel activator. We recommend its use on (1) parts buffed prior to chrome plating, (2) re-racked parts prior to chrome plating and (3) stripped chrome plated parts prior to re-chrome plating.

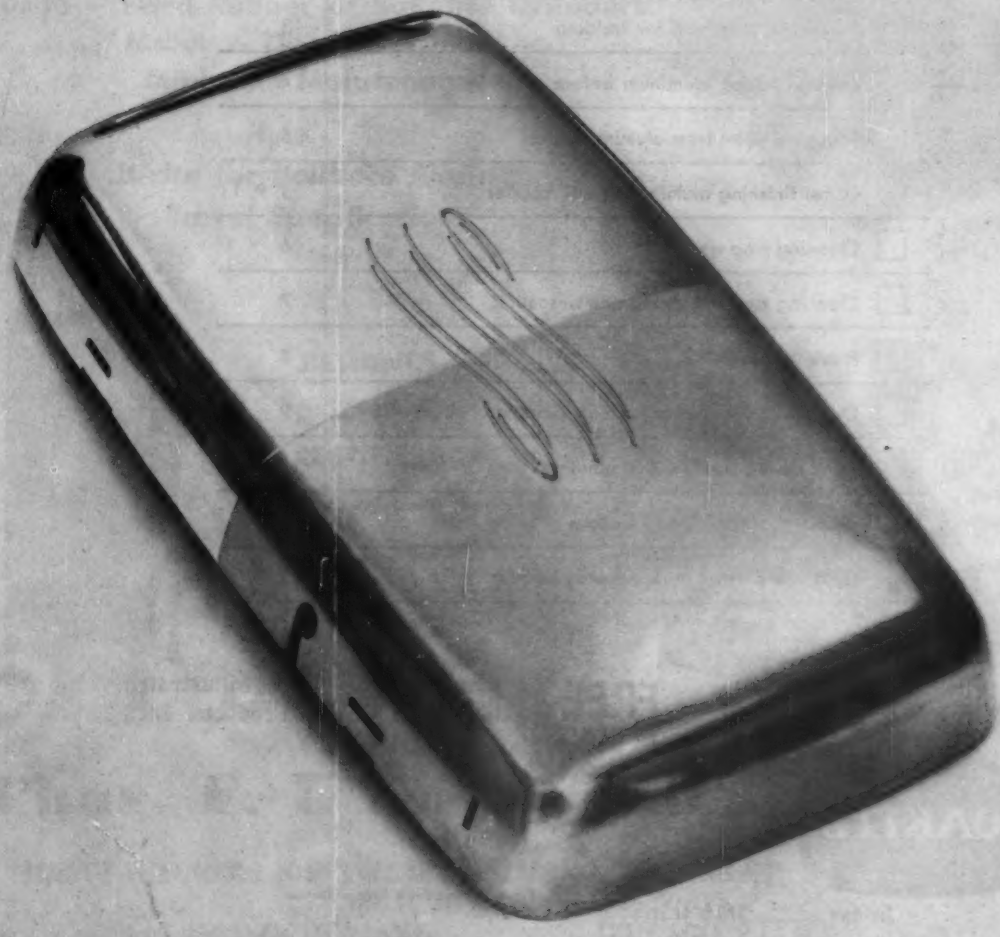
We'll be glad to send you a working sample. Better yet, ask to have a CLEPO Field Service man call with a sample to show you how efficient CLEPO 199-R is in improving chromium plating operations.

CLEPO 199-R is but one of many formulations developed in CLEPO Laboratories for cleaning, stripping, barrel finishing, and aluminum etching.

FREDERICK GUMM *Chemical Company Inc.*

538 FOREST STREET, KEARNY, N. J.

How to make metal stripping an exact science: What metal do you want to strip? There are eight metal strippers in the Enthone "ENSTRIP" series, which, in most cases, will do the specialized job thoroughly, quickly, economically. If one of these standard strippers won't precisely cover your requirements, there are special Enthone research developments available. Write us about your particular needs or problems. Include a sample of your product if possible. We'll be glad to recommend the best methods to follow. Enthone, Inc., 442 Elm Street, New Haven 11, Conn.



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ENTHONE, INC. IS A SUBSIDIARY OF AMERICAN SMELTING AND REFINING COMPANY

58-1

DO YOU NEED BETTER METAL CLEANERS FOR THESE JOBS?

All the tough jobs are covered by Oakite's booklet on *"Cleaning and preparing metal in aircraft production."* Just check this list of contents for reminders of operations that give you trouble:

	SEE PAGE
☐ Cleaning aluminum (with or without etching)	2
☐ Preparing aluminum for welding	3
☐ ChromiCoating aluminum before painting	4
☐ Stripping paint from aluminum, steel	5, 9
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☐ Controlling water in paint spray booths	12

FREE For your copy of this 16-page illustrated booklet, write Oakite Products, Inc., 18 Rector St., New York 6, N. Y.

OAKITE
SPECIALIZED INDUSTRIAL CLEANING
MATERIALS · METHODS · SERVICE
SCIENCE

In our 50th year.

Export Division Cable Address: Oakite

Technical Service Representatives in Principal Cities of U. S. and Canada

Metal Finishing is published monthly by Metals and Plastics Publications, Inc. (Formerly Finishing Publications, Inc.), 381 Broadway, Westwood, N. J., U.S.A. Entered as second class matter at the Post Office in Westwood, N. J. Volume 56, No. 9, September, 1958. Five Dollars Per Year.

For 59 Years ... L'HOMMEDIEU ...

year after year has manufactured Reliance Plating, Polishing Equipment, Supplies for Better and More Profitable Metal Finishing

RELIANCE PLATING BARRELS

Easy to Handle . . . Save Time and Money
Uniform Current Distribution
Plating Begins at Once

* * *

Lucite — Hard Rubber or Bakelite Cylinders
Motor — Geared in Head
Minimum Maintenance

* * *

Write for Reliance Plating Barrel Specifications

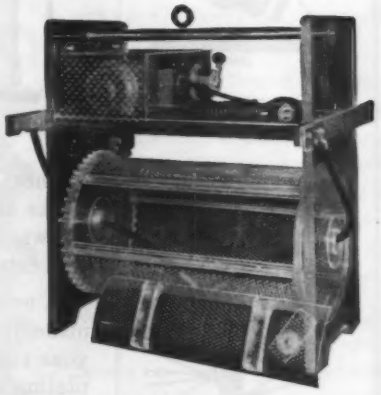
RELIANCE SELENIUM RECTIFIERS

Designed for all metal finishing operations.

High power factor and low ripple.

6 to 48 volts D.C.

Basic-self-contained or with Remote Control.



RELIANCE LUCITE

Portable Plating Barrel

Built of extra heavy High Temperature Lucite for volume production and stability.

Cylinder: 10"x18" inside. Equipped with Reversing Switch to permit stopping and securing barrel for loading and/or unloading.

Chas. F. L'Hommedieu & Sons Co.

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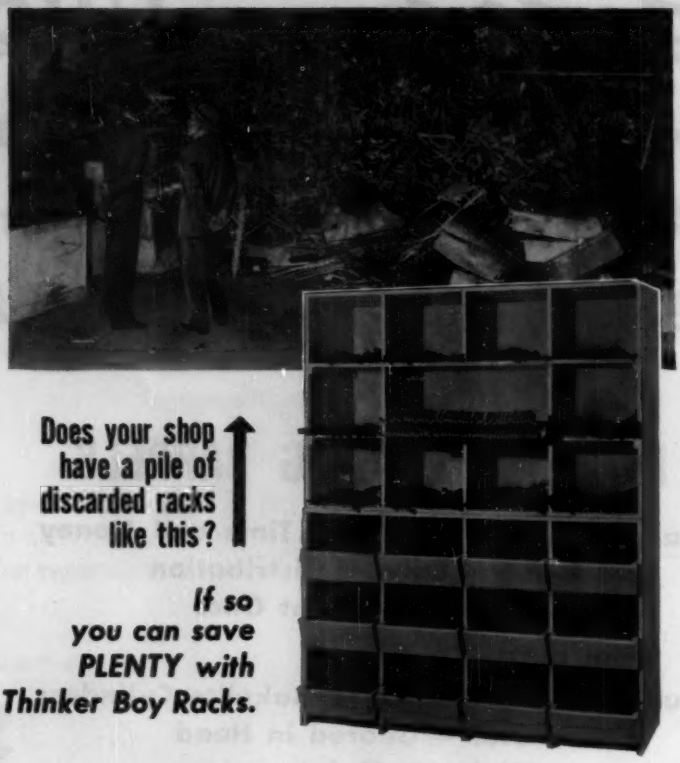
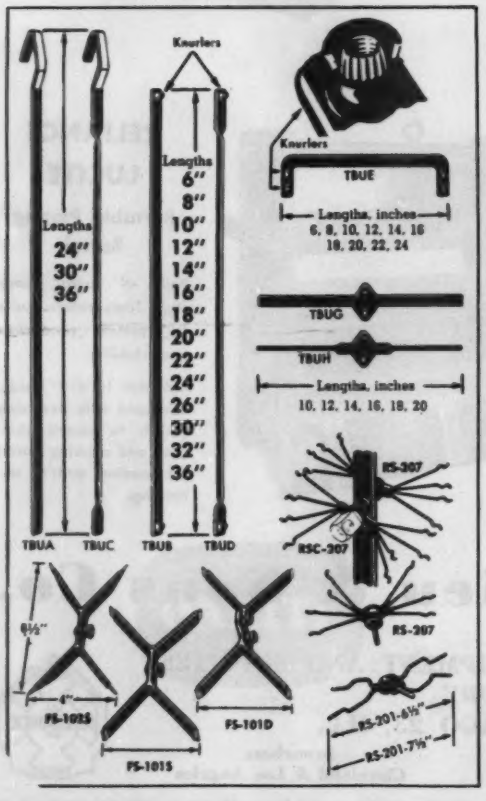
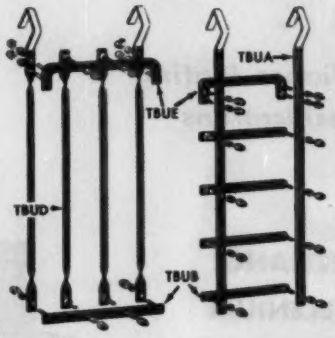
How to Convert Waste into PROFIT with Thinker Boy Plating Racks



Does your shop have a pile of discarded racks like this?

If so you can save PLENTY with Thinker Boy Racks.





Thinker Boy Plating Racks are made of mass-produced insulated parts that assemble with a leakproof seal.

When no longer needed you can disassemble the racks and reuse the parts or store the parts for future use in surprisingly small space.

With a supply of Thinker Boy Parts you can assemble fully insulated racks of your own design in minutes.

When you use Thinker Boy Racks you can quickly replace damaged tips with leakproof insulation seal–keep racks in service at full capacity–no dipping or waiting.

These great economies are possible because Thinker Boy Racks are made of standard, precoated parts assembled with screws. Disassembly or conversion to other styles is fast, easy and extremely practical.

A new illustrated bulletin, just off the press, shows how to make racks designed with Thinker Boy Sections. Send for your copy today—it's the key to revolutionary reduction in plating rack costs.

Ask your BELKE Service Engineer or send for illustrated bulletin.

Belke Manufacturing Company
947 N. Cicero Ave., Chicago 51

EVERYTHING FOR PLATING PLANTS

Result of chromate treating zinc in ***UNICHROME DIPS:***

eye appeal... corrosion protection... low cost

ZINC PLATE is a good finish as far as it goes. It can be made to go much further with chromate treating. It can be transformed into a number of outstanding finishes... with extra life, extra eye appeal, extra sales stimulation ... all at little extra cost.

One of the widest lines of chromate treating compounds available, Unichrome Dips can satisfy virtually any requirement ... of product, production method, and pocketbook. Brilliantly clear finishes have been produced for a material cost as little as 30¢ per 1000 sq. ft. of treated surface! Products can be clad for optimum corrosion resistance in a matter of minutes. And you also get an ideal base for clear, dyed, or pigmented organic coatings.

Along with wide selection and quality finishes, goes service. Service from solutions which give good "mileage" Service from M&T engineers who have long experience in metal finishing, and zinc finishing problems in particular. Send for detailed information and handy Unichrome Pick-A-Dip Chart.

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GENERAL OFFICES: RAHWAY, NEW JERSEY

Pittsburgh • Atlanta • Detroit • East Chicago • Los Angeles
In Canada: Metal & Thermit—United Chromium of Canada, Limited, Rexdale, Ont.

Columbia-Southern Trichlor provide economical answers

An exclusively developed neutral stabilizer in Columbia-Southern Trichlorethylene has aided metal fabricators in eliminating a number of troublesome degreasing problems.

In the past, many plants experienced extreme difficulties, resulting in damage to work or the degreaser itself. Frequently these difficulties could be traced to use of solvents "stabilized" with the inadequate alkaline amines.

Columbia-Southern Trichlor, on the other hand, is formulated to provide a stabilizer that assures built-in chemical protection against breakdown under light, heat, oxygen, acids, moisture and repeated distillations.

Aluminum sheet and formed parts are particularly sensitive to improperly stabilized solvent. Neutrally stabilized Columbia-Southern Trichlor is now specified by many large volume aluminum fabricators.

and expert Technical Service to vapor degreasing problems

Vapor degreasing offers an extremely flexible and low-cost cleaning method for parts ranging in composition from aluminum to steel, zinc, brass, magnesium, titanium, special alloys; running in weight from 268 ton generator stators to 1/240 oz. watch gears.

Columbia-Southern Trichlor is completely suitable for removing grinding and buffing compounds, graphite, grease, coolants, quenching and lubricating oils, other contaminants from the most intricately drawn or shaped parts. Parts come out thoroughly clean and dry, ready for next operation.

As a further bonus, Columbia-Southern Technical Service representatives work with customers in trouble-shooting and in establishing more effective and economical procedures for degreasing. These men have earned a reputation for solving the problem. Their services are at your disposal.

Have Columbia-Southern's experts check the efficiency of *your* vapor degreasing operation or help *you* with your solvent specifications. Just contact our Pittsburgh address, or any of the fourteen conveniently located District Sales Offices listed below.

COLUMBIA-SOUTHERN CHEMICAL CORPORATION

A Subsidiary of Pittsburgh Plate Glass Company • One Gateway Center • Pittsburgh 22, Pennsylvania

DISTRICT OFFICES Cincinnati, Charlotte, Chicago, Cleveland, Boston, New York, St. Louis, Minneapolis, New Orleans, Dallas, Houston, Pittsburgh, Philadelphia, San Francisco IN CANADA Standard Chemical Limited

pipe coils are old fashioned...

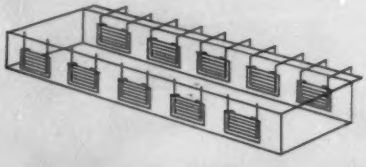
low installation and maintenance costs
greater heat transfer efficiency
lower space requirements

Write for free Bulletin P-52 "HOW TO CUT HEAT TRANSFER COSTS WITH PLATECOIL" for complete information.

KAWNEER uses stainless steel PLATECOIL® units in acid anodizing tanks

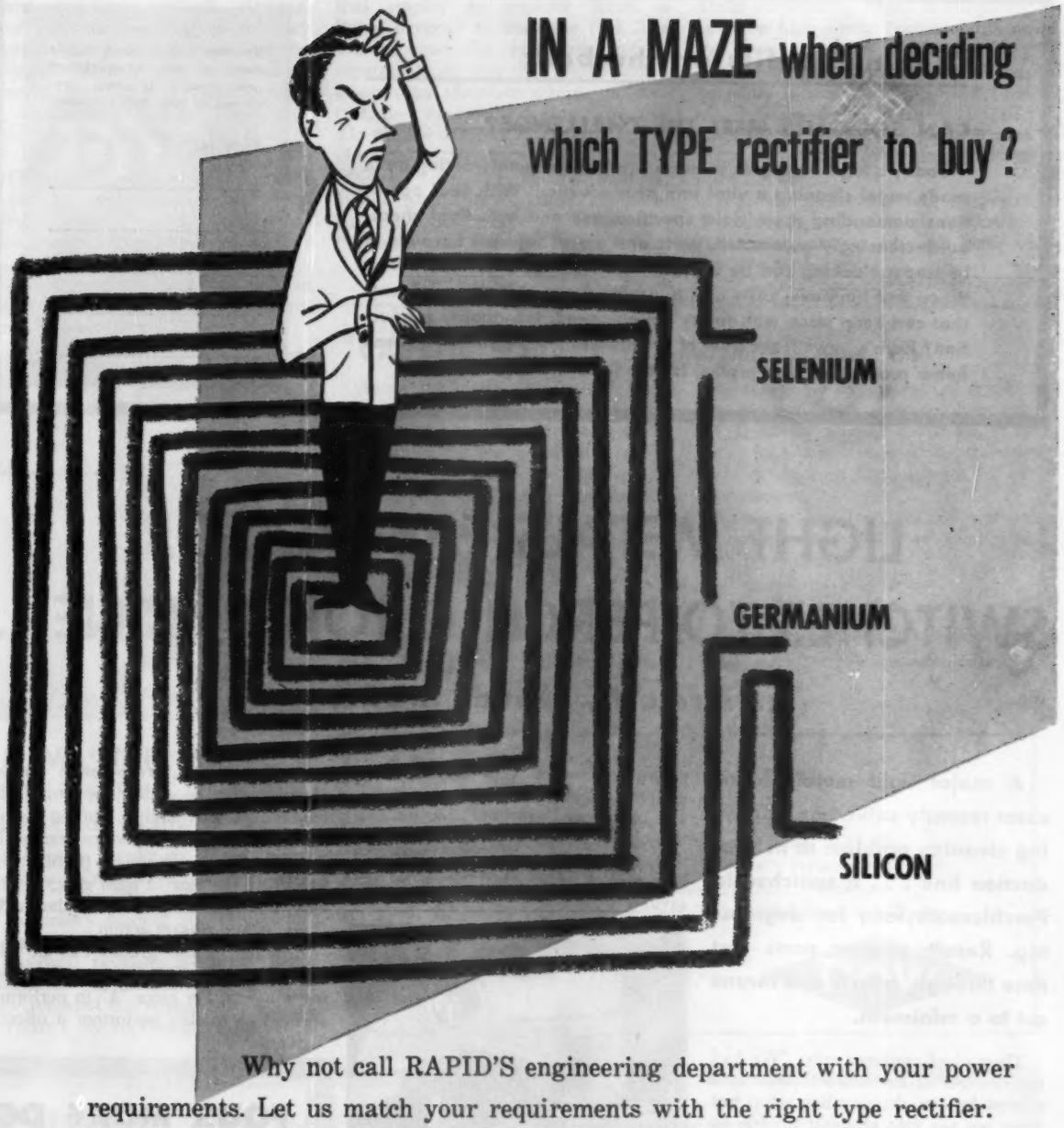
Ease of changing, cleaning and repair are among the advantages of PLATECOIL over pipe coils cited by the KAWNEER CO. Architectural Products Division at Niles, Michigan. Low installation costs, good maintenance and space savings over pipe coils plus heat transfer efficiency are advantages which this company has obtained by using PLATECOIL. The PLATECOIL units are used for heating in water seal, caustic and cleaner tanks; for cooling in anodize tanks.

The drawing and photo show the location of the PLATECOIL units in an acid anodizing tank with PLATECOIL connections which can be broken above the surface of the solution for easy maintenance.



TRANTER MANUFACTURING INC.
LANSING 9, MICHIGAN

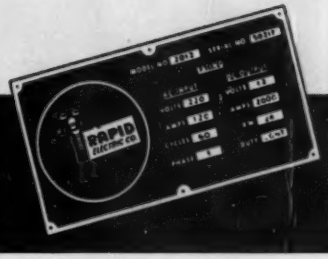
PLATECOIL®
DIVISION



Why not call RAPID'S engineering department with your power requirements. Let us match your requirements with the right type rectifier.

Because each semi-conductor has advantages to offer, and because RAPID supplies *all three*, you can be certain of obtaining sound technical advice.

Call TA 8-2200 for reliable technical service.



THE NAMEPLATE THAT MEANS *"More Power to You!"*

RAPID ELECTRIC COMPANY

12838 Fenkell Avenue • Detroit 27, Mich. • Diamond 1-8537

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Keeping profits on the boil:

CAN SOLVENTS MEET THE CHALLENGE?

Today's high standards in mass production metalworking have made metal cleaning a vital arm of production. With final operations demanding more rigid specifications and with final check-out increasingly automated, parts and pieces rejected because of improper cleaning can tie up your metal cleaning assembly line. When that happens, costs go up, profits down. Are there solvents that can keep pace with today's high-speed, top-quality production? Here's news from Dow of an important trend that can mean better production, and profits, for the industry.

You may wish to check certain items in this advertisement and forward to those concerned in your own company.

Route to:

LIGHT METALS FABRICATOR SWITCHES TO PERCHLOROETHYLENE...

cuts rejects, speeds production

A major light metals fabricator recently solved an annoying cleaning problem in its production line . . . it switched to Perchloroethylene for degreasing. Result: cleaner parts first time through, rejects and reruns cut to a minimum.

Their chief engineer says: "We had not thought of Perchloroethylene as a solvent for our cleaning line setup but when we ran into cleaning trouble on the line, our lab ran tests of Per against other chlorinated solvents. We found that (particularly in the case of aluminum and other white metals) we got better, reject-free cleaning and faster production because of the longer condensation time. Now we've standardized on Per".

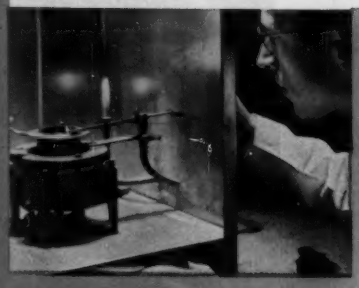
Nationwide switch to Per. A high-placed metals-cleaning theorist recently predicted: "The odds are high that a substantial part of production-line metal cleaning will be done with Perchloroethylene in the next three to five years". Nevertheless, right from the start Per has had to combat the false economy story that goes like this: "The additional heat needed for Perchloroethylene makes the degreasing operation costlier than using other standard chlorinated solvents". Actual on-the-job performance tests have shown that, in most instances, any additional heat cost is more than offset by the savings from better cleaning.

Metal parts cleaned in Dow Perchloroethylene vapors come out whistle clean.

Per wins Fahrenheit war. As metal-cleaning engineers know, the secret of Perchloroethylene's higher cleaning power is in its higher boiling point, for example, 250°F. as against 189°F. for trichloroethylene . . . a distinct advantage when removing entrapped moisture in porous metals, deeply recessed parts, and blind holes. Since water boils at 212°F., responsible metal cleaning men recognize the profit advantage of the higher boiling point solvent to insure moisture removal. Per's high-boil style is particularly helpful in the case of light gauge parts —by allowing longer, more thorough cleaning and rinsing action.

Although honor grades can be assigned tests of various vapor degreasing solvents, Per rates "A" in performance. As a quality performer it offers:

FOUR MORE DOW



CHLOROTHENE® . . .
Dow's new, safer solvent. No appreciable fire hazard. No flash or fire point. Today's hottest cold-cleaner for electrical equipment and machinery.

higher stability, reduced staining, lower solvents loss, higher solvency power, longer cleaning action, and the elimination of moisture. As an added bonus it comes highly recommended for aluminum cleaning. These customer benefits put Per at the head of the class.

When the vapor trails of competitive solvent claims confuse, most metal engineers consult with a company that makes many different kinds of solvents and can evaluate them all impartially. Dow, for example, will be glad to send a copy of its new 24-page brochure "Modern Vapor Degreasing".

•NEW "TRI" BY DOW
. . . helps missiles make clean getaway

Premature explosion of a rocket could be an expensive blast for everyone . . . especially the taxpayer. One of America's leading rocket builders hedged against its big birds going off half-cocked because of dirty missile hardware. A fast consultation with Dow revealed this urgent story . . .

Today's big rockets use liquid fuels that employ an oxidizer (such as liquid oxygen) to burn the fuel. The oxidizer and the fuel are kept in separate tanks and then piped into a combustion chamber where, on contact, they explode and burn. The missile trouble-shooters found that metal-cleaning materials used had left a residue, not inert to the oxidizer. Result: premature explosion. The problem: find the right material to clean the hardware.

Scientists at the Dow laboratory in Texas immediately began development of a new high purity Trichloroethylene for cleaning missile hardware. They conducted pioneer shock impact tests on many different solvents, and from the data developed, created HI-TRI* (high purity Trichloroethylene) to meet the most exacting requirements of the missile makers.

Dow also makes three other types of Trichloroethylene . . . neutral, alkaline, and extraction . . . for all sorts of down-to-earth uses.

*TRADEMARK OF THE DOW CHEMICAL COMPANY

•CAUSTIC SODA . . . Old workhorses never die

Along with new trends and techniques, a good deal of basic metal cleaning is still being done by alkali washing, using such chemical workhorses as Caustic Soda and Sodium Orthosilicate in cleaning formulations.

Most metal cleaning compounds made by experienced formulators are good. But even in these old-line products, there is a wide range of quality. You are assured of a top-quality product from the alkalinity standpoint if your formulator uses Dow Caustic Soda or Sodium Orthosilicate in his formulations.

Contact Dow for a list of modern formulators who use Dow Alkalies in their products.

★ ★ ★ ★

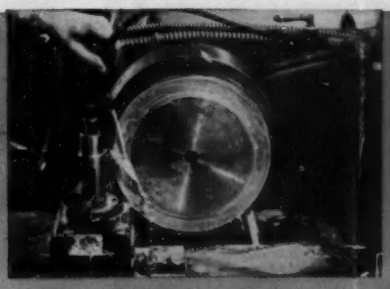
Dow makes many chemicals for many jobs in the metalworking industries. If you would like to know more about them, please write THE DOW CHEMICAL COMPANY, Midland, Michigan. Chemicals Sales Department 761F-1.

DOW CHEMICALS
basic to the metalworking industry

Chlorinated Solvents • Brominated Aliphatics • Alkalies
Ion Exchange Resins • Glycol Ethers • Preservatives
Hydrochloric Acid • Phenolsulfonic Acid • Ammonia
Industrial Glycols • Polyethylene Glycols • Polypropylene Glycols

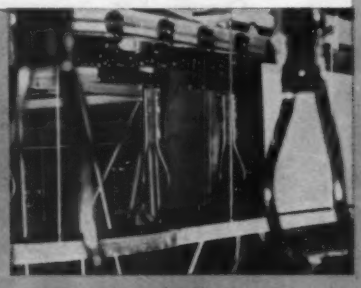
YOU CAN DEPEND ON DOW

CHEMICALS *for the metalworking industry*

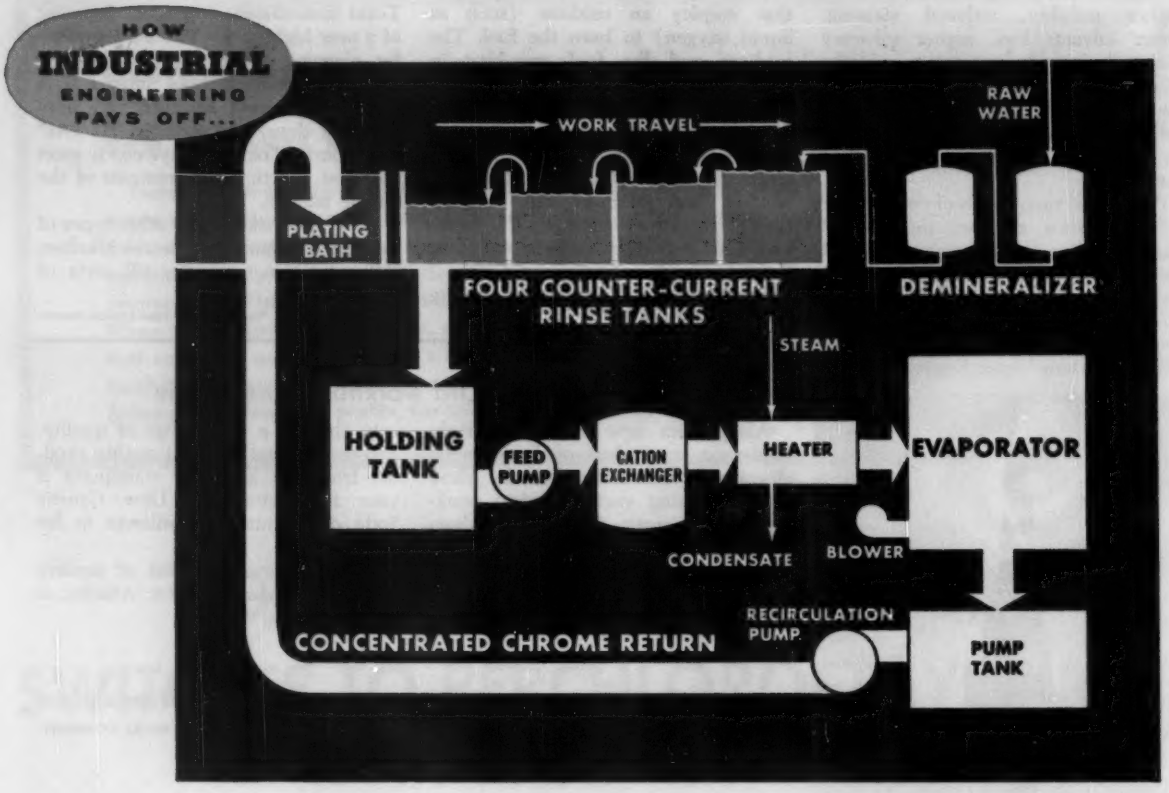


DOWICIDE® A . . .
Ends machinery's "Monday morning odor". Used as a preservative in soluble cutting oil, no bad odor at the machine due to the build-up of bacteria and mold will develop over the weekend.

SODIUM ORTHOSILICATE . . .
Recently improved S.O.S. by Dow is "nearly anhydrous". Now many metal-cleaning formulations containing it cut through dirt and grease quicker and better than ever.



METHYLENE CHLORIDE . . .
Its boil-point is low, its temperature high. Whenever the alloy is special and the temperature can't be too high, Dow's M.C. is the solvent of choice in vapor degreasing.



EXAMPLE:

Recovering Chromic Acid at Less Cost than Destroying It

The Chromic Acid Recovery System diagrammed above was engineered by INDUSTRIAL for a large automotive plant. It was developed after a *thorough analysis* of the entire plating operation indicated that desired efficiency would be reached by reducing the rinse water flow rate. When this was done, rinsing was still efficient and complete, with less than 4 ppm acid concentration in the final tank . . . but the higher concentration in the first tank made it possible to use a fast, conventional evaporator to recover Chromic Acid. No pre-concentration was necessary (the small cation exchanger only removed metal contaminants).

After making a careful analysis of operating costs, including labor, power and amortization, as compared with a destruction system of equal capacity, The INDUSTRIAL Recovery System showed a net *GAIN* of $26.65 per day, against destruction *COSTS* of $54.06 per day!

Here, then, is another good example of how INDUSTRIAL engineering pays off by increasing plating efficiency and economy.

INDUSTRIAL

INDUSTRIAL FILTER & PUMP MFG. COMPANY
5906 Ogden Avenue, Chicago 50, Illinois

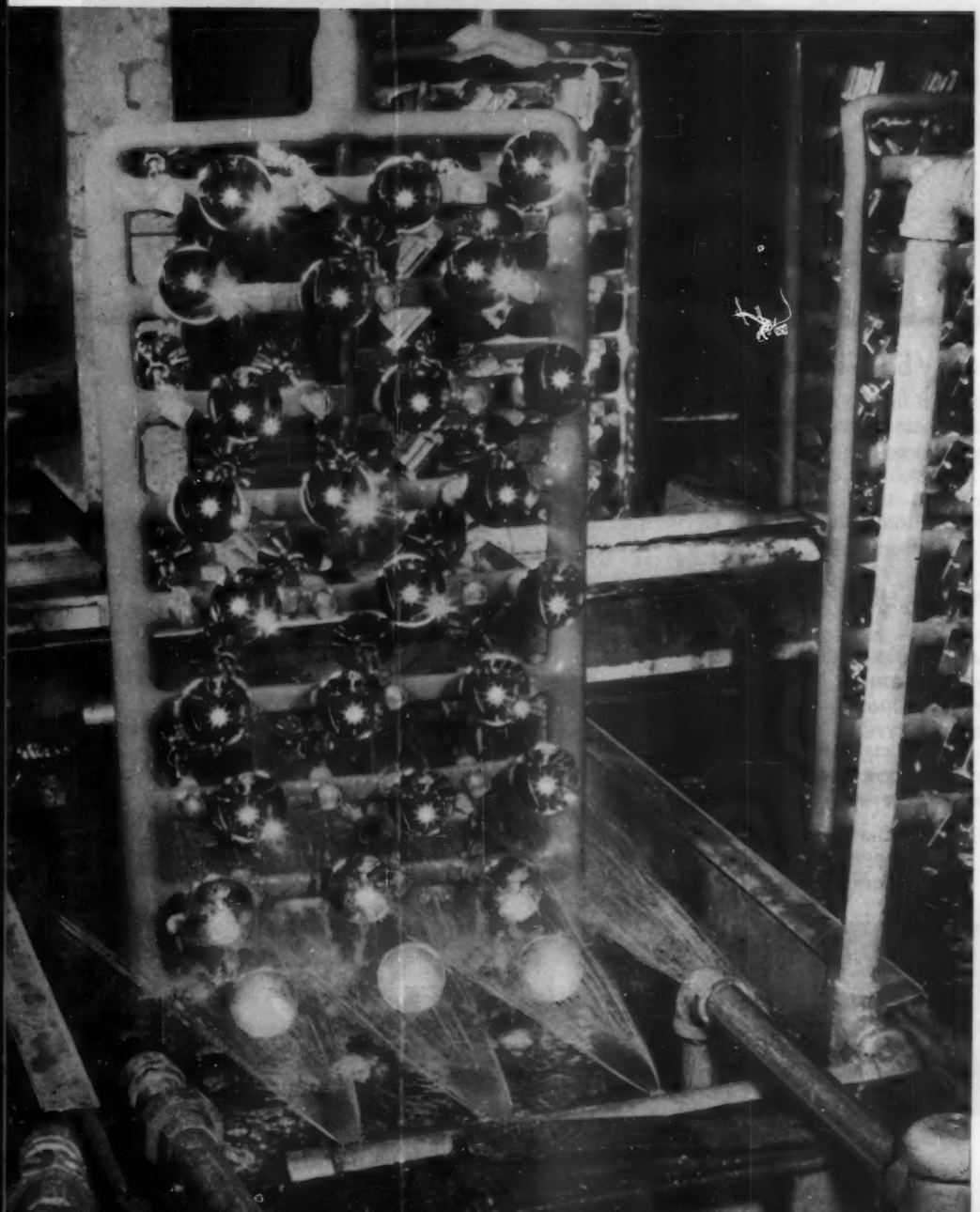
Call or write INDUSTRIAL to find out how an engineered system like this can solve your specific plating waste and recovery problems.

P-258

PRESSURE FILTERS ◆ ION & HEAT EXCHANGERS ◆ WASTE-TREATING EQUIPMENT

Get the extras that cut costs and guarantee consistent results... Competitively tested materials, comprehensively and conscientiously serviced by a nationwide network of sales engineers and distributors. Federated's materials include new ASARCO-MAX COPPER anode, triple-life Conducta-Core lead anode, copper, zinc, tin, tin-lead, cadmium, brass and silver anodes. Nickel salts. Zimax, Nimax, Cadmax brighteners. New Conmax conversion coatings for zinc and cadmium plated parts. Federated Metals Division of American Smelting and Refining Company, 120 Broadway, New York 5, N. Y. In Canada: Federated Metals Canada, Ltd., Toronto and Montreal.

FEDERATED METALS DIVISION OF



ASARCO

AMERICAN SMELTING AND REFINING COMPANY

COSTS NO MORE THAN A LUXURY AUTOMOBILE...

Yet STEVENS "Little Steve"
gives you *automatic* metal finishing and processing!

SAVES TIME—SAVES SPACE—SAVES MONEY!

Now you can afford automatic metal finishing and processing—and automatic control—without making a costly capital investment for equipment! "Little Steve" offers you high-volume capacity with minimum space requirements and installation costs. For the price of a luxury automobile, you can have all of the advantages of automatic plating or processing.

"Little Steve" also offers you savings in supplies and labor. It's accurate, reduces rejects, and improves quality! Its low initial cost makes it the ideal choice for any size plating or metal processing operation!

TALK ABOUT VERSATILITY!

Stevens "Little Steve" can be adapted to perform a great many metal finishing operations, including . . .

- ANODIZING (INCLUDING DYEING)
- DIP PAINTING
- FLO-COATING
- ELECTROTYPE (PRINTED CIRCUITS PLATING)
- PLASTIC COATINGS
- BRIGHT DIPPING
- PROPRIETARY TREATMENTS
- HOT TIN DIPPING
- ULTRASONIC CLEANING
- HARD CHROME PLATING
- ELECTROPOLISHING
- TIN IMMERSION PROCESSING
- COPPER IMMERSION PROCESSING

For more details about the "Little Steve" and what it can do for you, contact your local Stevens Sales Representative or write direct to: Frederic B. Stevens, Inc., 1800 Eighteenth Street, Detroit 6, Michigan

Remember—When you go automatic—go Stevens!

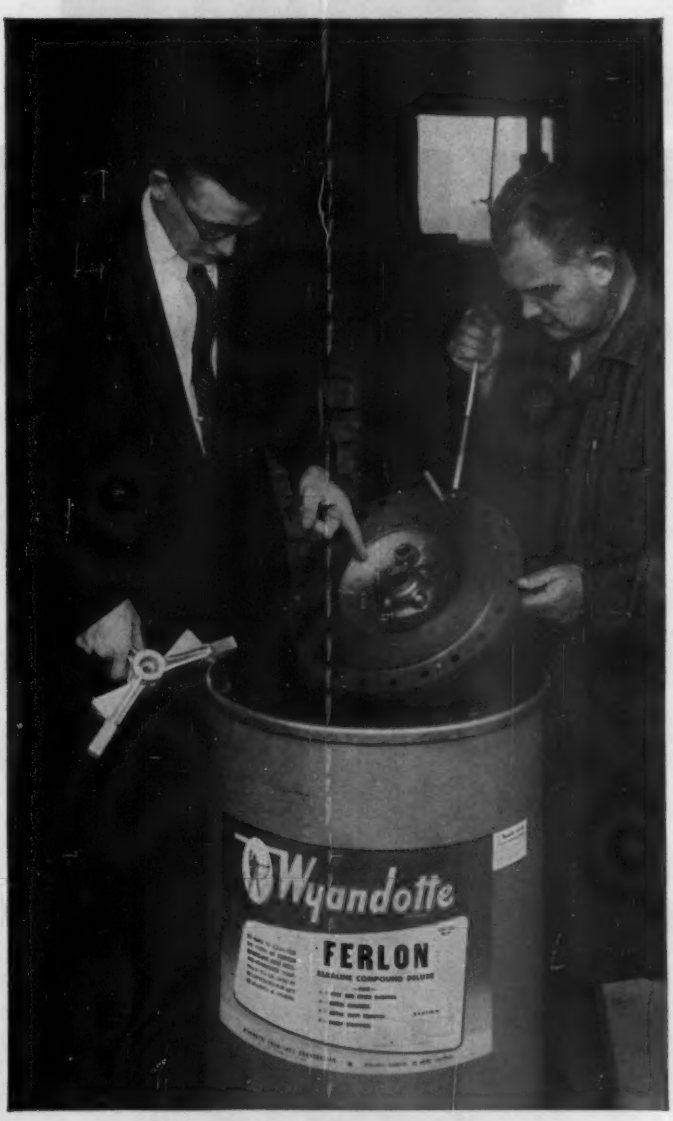
frederic b. **STEVENS,** inc.

DETROIT 16, MICH.

BUFFALO CHICAGO DETROIT CLEVELAND
DAYTON NEW HAVEN SPRINGFIELD (OHIO)

Is rust on precision parts a problem in your plating department?

FERLON REMOVES RUST WITHOUT HARMING METAL!



Wyandotte Representative Wm. Heinecke (left), and C. D. Roberts, Chief Chemist at A. O. Smith Corporation's Pacific Coast Works at Los Angeles, examine rust-free iron castings. A. O. Smith uses Wyandotte FERLON in soak tank — also adds it to the electrocleaner to enhance smut removal, improve detergency, prolong cleaner life.

THAT'S RIGHT! When damaging rust goes to work on steel parts, you can save time and replacement costs by using Wyandotte FERLON, alkaline de-rusting compound. That's because FERLON, unlike acids, removes rust quickly WITHOUT INJURY TO SOUND METAL — makes it ideal for use on expensive, close-tolerance machined parts!

For example, at A. O. Smith Corporation's Pacific Coast Works, a simple immersion in FERLON effectively removes heavy rust from large machined cast-iron parts. In addition, FERLON in the electrocleaner has resulted in much cleaner, smut-free castings. Cadmium plating is much brighter and of a higher quality.

Improve *your* plating by using FERLON for rust and smut removal. Call in your Wyandotte man, today, for a demonstration. Or write direct for complete details. *Wyandotte Chemicals Corporation, Wyandotte, Michigan. Also Los Nietos, California. Offices in principal cities.*

Wyandotte
CHEMICALS
J. B. FORD DIVISION
The Best in Chemical Products for Metal Finishing

specify
Victor
Phosphoric
Acid

IF YOU BRIGHT

More and more designers are incorporating bright dip aluminum in products they design. Why? Because more and more manufacturers recognize the advantages of this finish: advantages in durability . . . advantages in speed . . . and advantages in cost.

Many bright dip finishers have turned to Victor for their phosphoric acid requirements because they recognize the importance of a source with multiple plant phosphoric acid production.

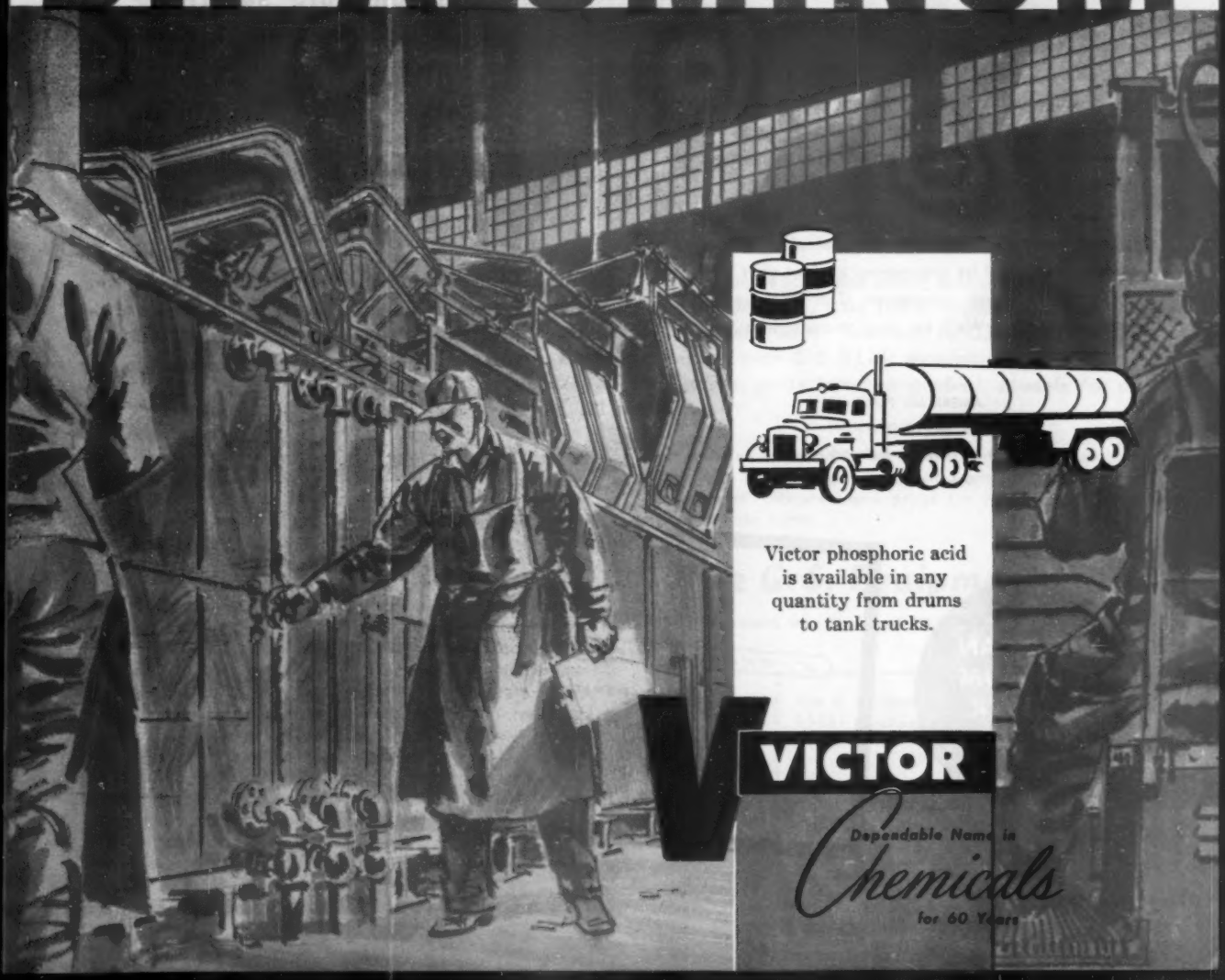
If you are planning to bright dip aluminum, you, too, will profit if you specify Victor phosphoric acid. It is available in all concentrations . . . 75%, 80%, 85%. Your Victor distributor, located near you, is able to supply you. Write us or telephone collect for his name.

VICTOR CHEMICAL WORKS
155 N. Wacker Drive, Chicago 6, Phone: DEarborn 2-4010

Availab'e now! FREE! Victor's technical service department has just completed a bulletin describing a new, simple method for determining the aluminum concentration in bright dip baths. Write for your copy today. There's no obligation.

30 MINUTE METHOD FOR
DETERMINING ALUMINUM CONTENT

DIP ALUMINUM



Victor phosphoric acid is available in any quantity from drums to tank trucks.

VICTOR

Dependable Name in *Chemicals*

for 60 Years

Controlled Grain Size with American Extruded Silver Anodes

These scientifically shaped anodes retain 80% of original active surface area after 85% by weight has been plated off!

Costs are lowered by prolonged anode life, minimized polarization and less silver scrap to be refined. In addition, the APW Extrusion Process controls grain size within definite ideal limits so that corrosion is smooth and uniform. Electro-deposits are consistently smooth. Shedding is virtually eliminated. Rejects are a comparative rarity!

We are anxious that the silver you buy in anodes is used most efficiently and economically. Special anode shapes will be engineered to meet your particular plating bath conditions. Call or write for a representative. We'll be glad to assist with your plating problems.

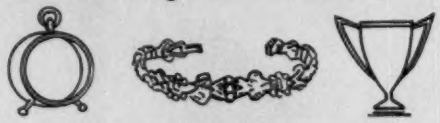
AMERICAN PLATINUM
& SILVER DIVISION
231 New Jersey Railroad Ave.
Newark, New Jersey

RHODIUM PLATING for greater protection . . . greater wear

RING SHANKS SETTINGS | PRINTED CIRCUITS | RELAYS

Rhodium is one of the group of platinum metals. It has a hard, brilliant white, non-tarnishable, highly reflective surface. It is extremely resistant to corrosive conditions. These properties make rhodium particularly valuable in many decorative, industrial, electrical and electronic applications. In general rhodium adds lustre to jewelry and other decorative objects. It protects electrical contacts and shows negligible wear when subjected to constant abrasion of moving parts. If you have a particular plating problem where utmost protection is needed, investigate rhodium.

ATOMEX immersion gold solution



CLOCK ASSEMBLIES | COSTUME JEWELRY | TROPHIES

A fast, economical plating process for depositing a thin layer of 24 Karat Gold on a wide variety of industrial items. By means of a simple bath a dense coating can be achieved with 30 per cent less gold. All parts of the object receive a uniform deposit. All the gold in the bath is used and the spent solution is discarded. Analytical Control is not necessary. Atomex is a useful addition to any plating shop.

CHEMICAL DIVISION
113 Astor Street
Newark, New Jersey

AMERICAN PLATINUM & SILVER DIVISION

ENGELHARD INDUSTRIES, INC.
113 ASTOR STREET
NEWARK 3, NEW JERSEY

CHEMICAL DIVISION

Another G-S "First" . . .

★TEMPERATURES TO 220°F. ★LOADS TO 275 LBS.
★BUSSED FOR 1420 AMPS. ★100% THRU-CYCLE
★ALL REPLACEABLE PARTS ★FITS YOUR EQUIPMENT

The New
G-S "Trussed-Rib" Bolted Plating Cylinder

(a Gill-Singleton Product)

Outlasts them all, up to 3 to 1. Operates in solutions other makes can't tolerate. Better performance, less maintenance . . . plus 100% replaceable parts to extend service life practically "forever". Ribs "Trussed" by GS XL-12 Coated Stainless Steel Rods. Bolt-Caps sealed with G-S XL-8. Available in H-T Plexiglas, Polydur, Tempron (any combination, parts interchangeable). Models for all makes belt or gear drives, all sizes.

"Work-horse" of the industry. For the plater who demands more than any cylinder ever offered before. **Load it to 275 lbs.; run it "hot" process to 220°F, — thru-cycle; in currents to 1420 amps.** Takes roughest beating, then asks for more. No wear or damage need be permanent. **Replace any component yourself, in 20 minutes,** regardless how long in service — using only a ½" wrench. No more down-time and high costs of "outside" repairing, rebuilding. **Parts standard, interchangeable,** available from stock in H-T Plexiglas, G-S Plastics' new, tough Polydur, and Tempron. Keep on hand for immediate use. No danger of obsolescence regardless of new material developments. **Trussed Construction for Extra Belly-Strength** — no bulging. Cylinder panels are tongue and grooved into heads and heavy 2" square ribs; "trussed" full-length from head-to-head with Stainless Steel rods, coated with G-S Plastics' XL-12 Bake-on Plastisol. Rods fastened at both ends using Stainless Steel washers and nuts, recessed into heads and covered by H-T Plexiglas caps. Each cap sealed with G-S Plastics' XL-8 Air-dry Plastisol to protect against corrosion, etc. **Cylinders to fit all makes superstructures. Belt-driven cylinders with superstructures to fit all makes tanks and drives.** For order or quotation, state make, model, size and type of superstructure. **Send for "replacement" literature and prices for all makes cylinders, superstructures, tanks.**

The G. S. Equipment Co.

15583 Brookpark Rd., Cleveland 35, Ohio, CLearwater 2-4770

For convenience, clip coupon to your letterhead and mail today!

The G. S. Equipment Co.
15583 Brookpark Rd., Cleveland 35, Ohio

Send complete literature and prices.

Name .....

Address .....

City ..... State .....

HERE'S YOUR REWARD

for telling us what <u>you</u> want in brighteners--

ISOBRITE™

PLATING BRIGHTENERS

Now—28 ISOBRITE BRIGHTENERS

For Zinc, Cadmium, Copper and White Brass

HAVE THE *FOUR* BIG FEATURES YOU ASKED FOR!

When the Allied line of brighteners, now known as ISOBRITE, had the famous ARP trademark on them, we made a survey to find out exactly what *you* wanted most in brighteners. Your answers helped guide our research and development staff in evaluating and consolidating our new line.

Now, here are the results—the industry's most complete line—28 *ISOBRITE Brighteners with these most-wanted features:*

1. LONGER LIFE

Your own records will show ISOBRITE Brighteners give longest possible life in rack or barrel plating operations.

2. BRIGHTNESS

You'll see for yourself that ISOBRITE Brighteners give a diamond-like sparkle that just can't be matched.

3. THROWING POWER

Even if your product has deep recesses, you'll get a uniform, all-over brightness that only ISOBRITE Brighteners can give you.

4. WIDER BRIGHT RANGE

ISOBRITE Brighteners operate efficiently over exceptionally wide current density ranges and have greater tolerance for temperature change.

Remember, there's an ISOBRITE Brightener especially designed for your specific operations—whether you're rack or barrel plating zinc, cadmium, copper or white brass . . . an ISOBRITE Brightener that is entirely compatible with most other brighteners. Don't just order brighteners—specify ISOBRITE. There *is* a difference!

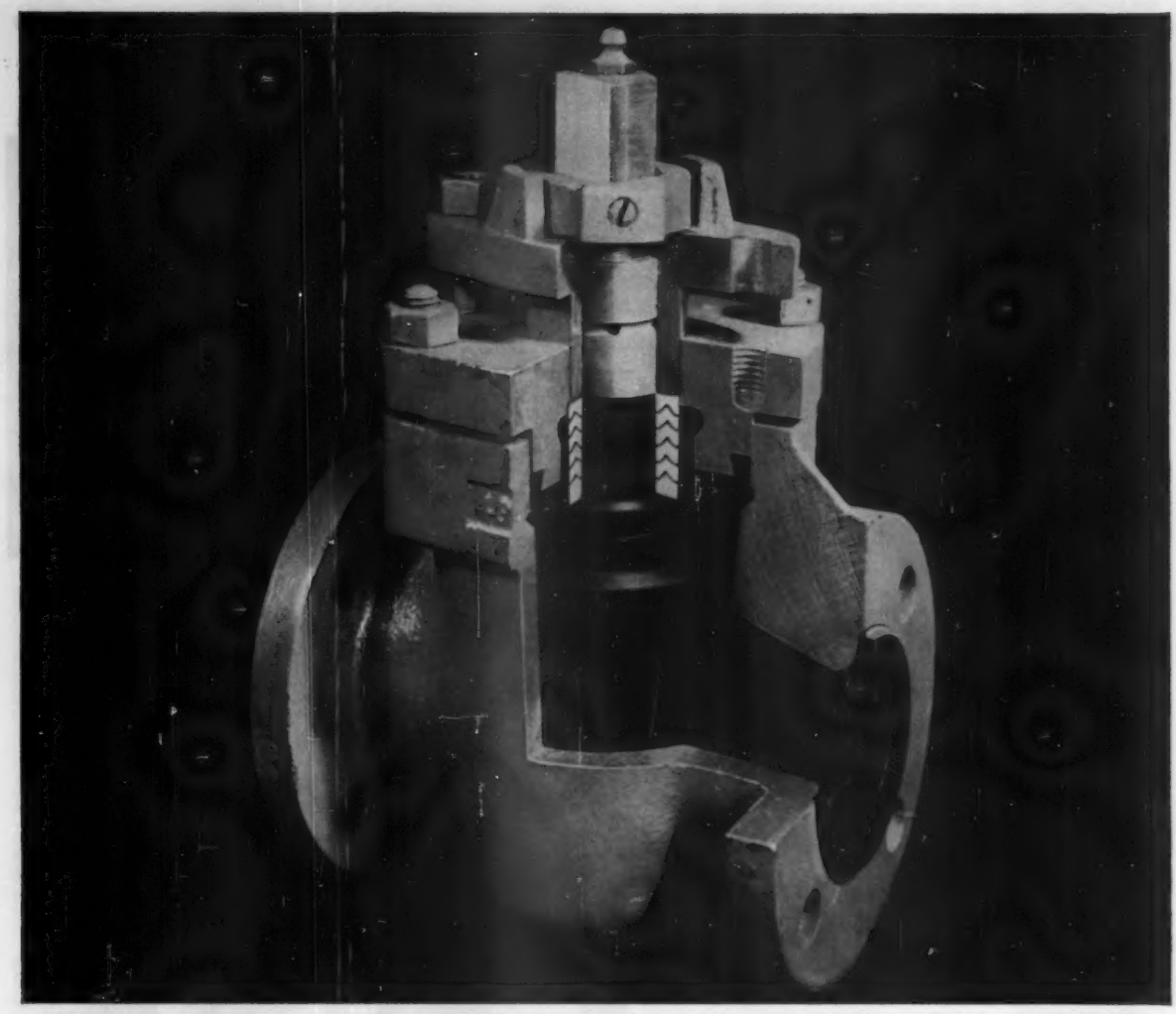
Your Allied Finishing Systems Engineer will be glad to discuss the benefits of ISOBRITE Brighteners in your operations. He's listed in your 'phone book under "Plating Supplies". Or, write for technical data and product list giving details of your operations.

Allied Research Products, Inc.

4004-06 E. MONUMENT ST., BALTIMORE 5, MD.

BRANCH OFFICE: 400 MIDLAND AVE., DETROIT 3, MICH.

Chemical and Electrochemical Processes, Anodes, Rectifiers, Equipment and Supplies For Metal Finishing



You can see why Saran Lined Pipe costs so little per year of service

Saran anchored within a steel casing safely conveys corrosive liquids for years of trouble-free service

There's something special about this valve. It's saran lined and has a Teflon V-ring packing for easier opening and closing and more perfect sealing with less pressure. And yet, the fact that valves like this are stock items is another example of why saran lined piping systems are more economical to install.

Immediate availability of Saran Lined Pipe, valves, pumps and fittings means there's no waiting. And Saran Lined Pipe can be cut and threaded right on the job with conventional tools. This lower fabrication cost, combined with the long life of corrosion-resistant saran, means that complete saran lined piping systems cost less in the long run.

Saran Lined Pipe with the new gray liner gives trouble-free service under operating pressures from full vacuum up to 300 psi and temperatures from -20° F. up to 200° F.

Send the coupon today to learn how you can save by installing a complete corrosion-free piping system with Saran Lined Pipe, valves, pumps and fittings. And be sure to ask about Saraloy® 898 tank linings. THE DOW CHEMICAL COMPANY, Midland, Michigan.

SARAN LINED PIPE COMPANY
DEPT. 2003 D 1
2415 BURDETTE AVENUE
FERNDALE 20, MICHIGAN

Please send me information on: ☐ Saran Lined Pipe, fittings and valves ☐ Saran lined centrifugal pumps ☐ Saraloy 898 chemical-resistant sheeting

Name_____ Title_____ Company_____

Address_____ City_____ State_____

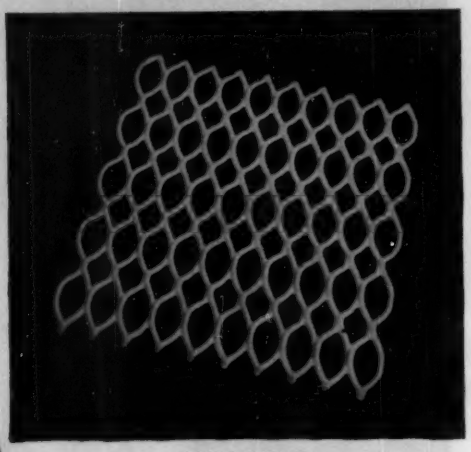
YOU CAN DEPEND ON DOW

OUTSTANDING NEW QUALITY

with

CORVEL†

Fusion Bond Finishes



WIRE PRODUCTS

CASTINGS

STAMPINGS

• CORVEL Fusion Bond Finishes, applied by the Whirlclad* Finishing Process, now give these unique product finish advantages:

- Controlled thickness in one dip—from .005″ to .060″.
- Thorough coverage of corners, sharp edges, projections, joints and intersections—without bridging across gaps.
- Good adhesion to substrate surfaces.
- Resistance to corrosion and most chemicals.
- Premium appearance—multiple color selection, controlled sheen.
- Durable color and gloss.
- The RIGHT Finish for YOUR Product.

CORVEL Fusion Bond Finishes are powders specially formulated for use with the Whirlclad* Finishing Process. The part to be finished is first heated, then dipped into a fluidized bed of *dry* CORVEL powder. The powder, maintained in a state of whirling suspension, bonds by fusion on contact with the part.

CORVEL Finishes are now available in Cellulosic, Vinyl, Epoxy, Nylon, Chlorinated Polyether, and Ethylene base resins.

***WHIRLCLAD Finishing Process:**

A new, patented production process for cladding metals and other materials with plastic resins—exclusively licensed in the U.S. and Canada by Polymer Processes, Inc., an affiliate company.

We invite your inquiry for product finish economy and improvement. Write today for our new CORVEL Bulletin.

NATIONAL POLYMER PRODUCTS, INC. / Reading, Pennsylvania

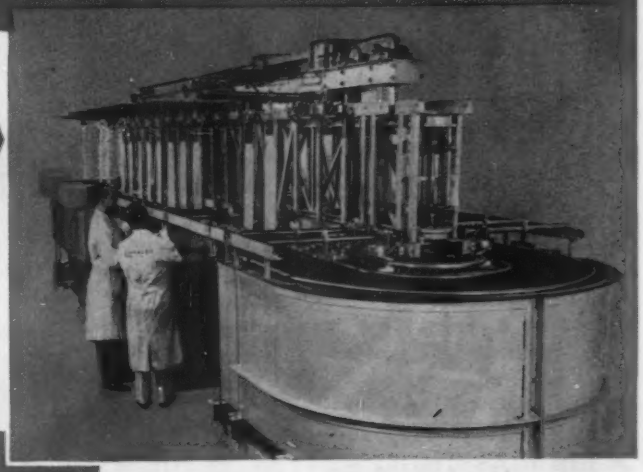
A subsidiary of The Polymer Corporation

†Polymer Corporation trademark for finishing materials

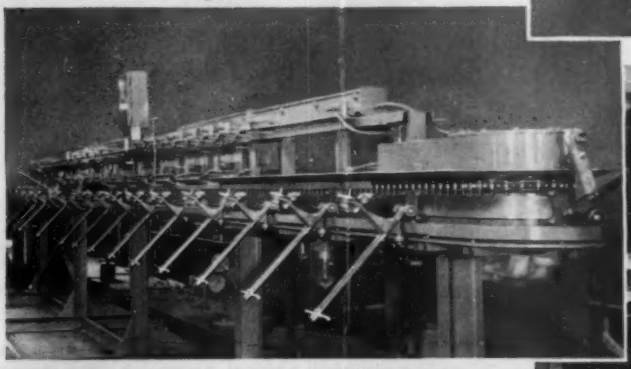
POLYPENCO

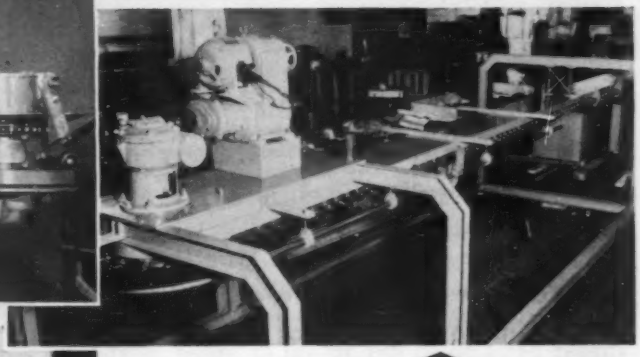
LASALCO has an automatic for any plating or anodizing operation!

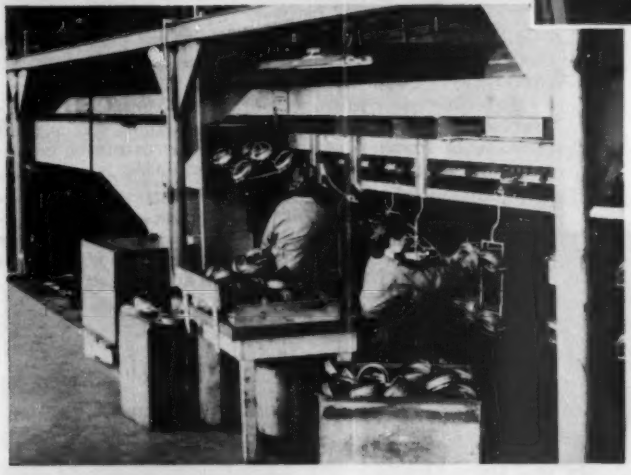
CYCLEFLEX Full Automatic Plating & Anodizing Machine.
Most versatile of all automatics! No overhaul or rebuilding to switch cycles—just a simple moving in positions of pick-up heads and minor changes in tank partitions. Safety controls prevent conveyor breakdowns and load dropping. Many adaptations for any requirement. Low headroom.



SELECT-O-MATIC Multiple Process Plater.
Handles 2, 3 or more process cycles at one time! While loading, operator merely turns dial to select desired cycle for individual racks and the rest is fully automatic! One operator can handle several different processes simultaneously. Saves investment in a variety of machines—reduces floor space requirements—cuts maintenance to a minimum.







DAW JUNIOR CONVEYOR
Fully automatic handling of individual parts. Tailor-made for any production output and any cycle. Tank to tank work transfers raise carriers to above horizontal to prevent solution carry-over, and eliminate air or gas pockets in work. Automatic unloading if work permits.

DAW SENIOR CONVEYOR
Custom-engineered, fully automatic, for any job, any cycle, any production requirement. Transfers from one tank to another raises work from vertical to above horizontal to facilitate drainage, prevent solution dragout. Handles racks for all sizes and quantities of parts. Automatic unloading unless shape or work size is too large.

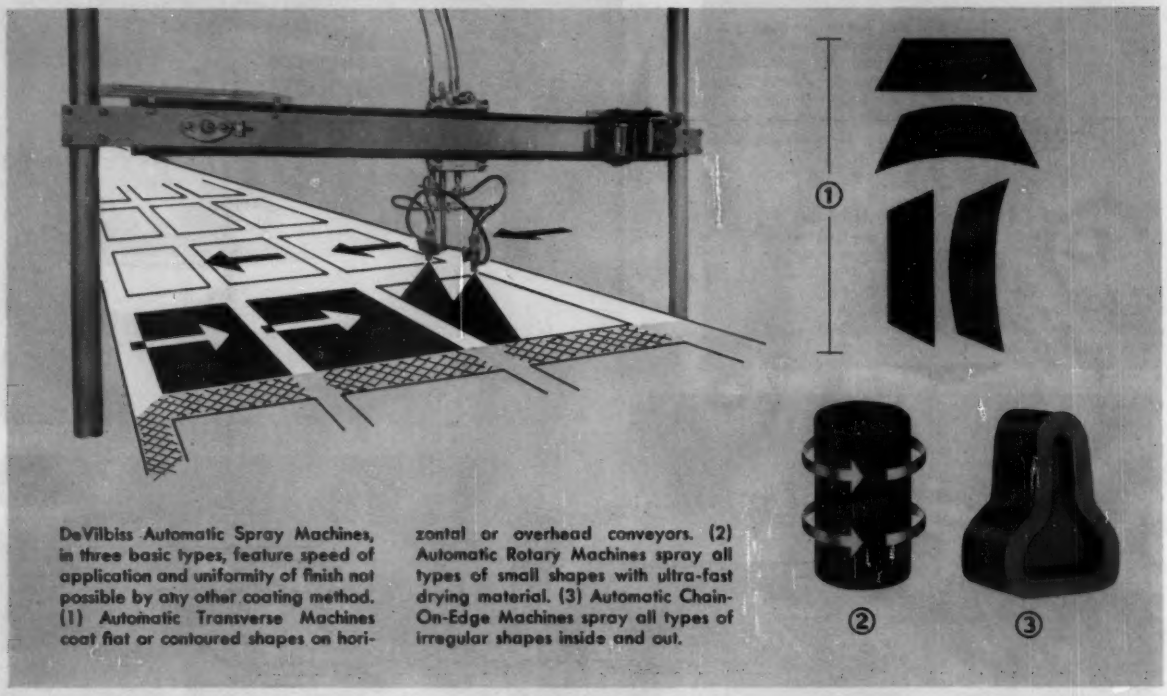
Write For Descriptive Literature

● Lasalco has the sound experience and proved ability to analyze your exact needs, and to give you equipment that will increase output do it better, faster, and far more profitably. Phone or write for the services of a Lasalco engineer.

LASALCO, INC.

HOME OFFICE: 2820 LaSalle St. • St. Louis 4, Mo. • PRospect 1-2990
IN TEXAS: 2805 Allen Street • Dallas, Texas • Riverside 7-5814

DeVilbiss Automatics...
a cost-saving answer to coating problems



DeVilbiss Automatic Spray Machines, in three basic types, feature speed of application and uniformity of finish not possible by any other coating method. (1) Automatic Transverse Machines coat flat or contoured shapes on horizontal or overhead conveyors. (2) Automatic Rotary Machines spray all types of small shapes with ultra-fast drying material. (3) Automatic Chain-On-Edge Machines spray all types of irregular shapes inside and out.

You can increase rate of production, improve quality of your work, and reduce costs to fraction of manual methods!

DEVILBISS

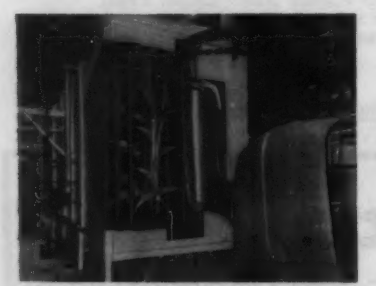
Complete mechanization with DeVilbiss Automatics eliminates variation of manual operation and boosts production—in many cases 500% or more.

Gun positions are precisely set to coat your product quickly, uniformly, with accurate lapping and minimum overspray.

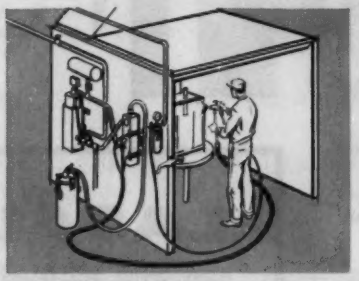
This precision means greater uniformity of spray-applied film; assured uniformity of color, luster, and texture of finish. Use of materials is carefully established and maintained; rate of production is constant.

What's more, you can know in advance whether automatic painting is practical. We will test-run your product in the DeVilbiss Laboratory without charge or obligation. Call our nearest branch office; or write us direct for Series I-8000 Bulletins on automatic spraying.

THE DEVILBISS COMPANY, Toledo 1, Ohio • Barrie Ontario • London, England • Branch Offices in Principal Cities

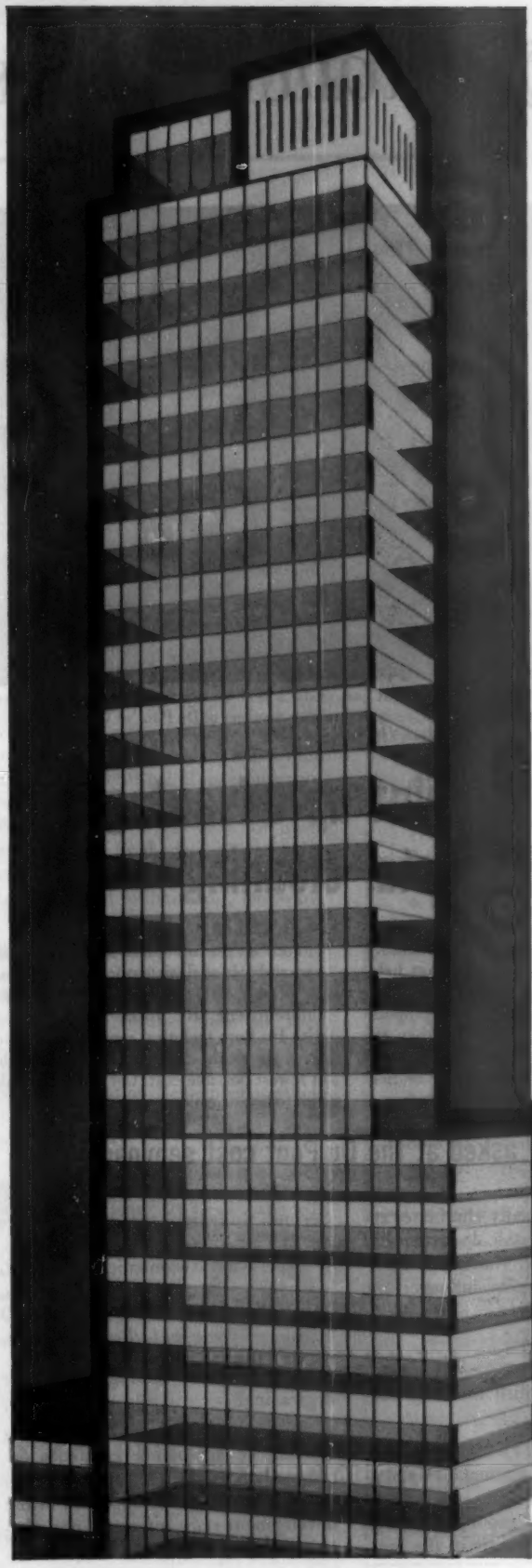


DeVilbiss Flo-Coaters. Save manpower and floor space in prime- or single-coat applications. *Write, stating requirements.*



DeVilbiss Hot Spray. Provides heavier film build, with faster drying, less overspray, and fewer rejects. *Send for Bulletins IE-114B and F-286.*

DeVilbiss Fluid Hose. Unsurpassed for resistance to solvents, oils. Flexible, kinkproof. Full line of connections. *Send for Catalog IE-E.*



GOLDEN AGE

FOR ALUMINUM!

PFIZER OXALATES CAN HELP YOU ACHIEVE BETTER LIGHT-FASTNESS, MORE UNIFORM COLORING

● In the fast-growing field of colored aluminum, you can develop important sales advantages with PFIZER OXALATES.

In making gold colored aluminum, particularly, oxalates will give you improved light-fastness and uniformity. Coloring is accomplished by precipitating iron oxide in the aluminum oxide coating from solutions containing ferric oxalate or ferric ammonium oxalate. Shades, from yellow to brown, can be obtained readily by varying the processing technique.

Why not investigate the big profit potential in producing better colored aluminum through the use of PFIZER OXALATES? Write for further technical information on PFIZER OXALATES.

Manufacturing Chemists
for over 100 Years

Pfizer

CHAS. PFIZER & CO., INC.
Chemical Sales Division
630 Flushing Ave., Brooklyn 6, N. Y.

Branch Offices:
Chicago, Ill., San Francisco, Calif., Vernon, Calif.
Atlanta, Ga., Dallas, Texas

Related to this field is Aluminum Company of America
Patent No. 2,290,364, and possibly others.

DU PONT PRODUCT NEWS

QUESTIONS FROM THE FLOOR are answered during a Du Pont cost-analysis seminar by technical representatives George Hetrick and Dave Haring (left to right). Fred Low, technical service manager of Du Pont's Chlorine Products Division, stands by as moderator. Cost-analysis specialists are featured speakers at Du Pont Cost Seminars.

Unique Du Pont seminars point up advantages of cost analysis in metal cleaning

As an extra service for their customers, distributors of "Triclene" D trichlorethylene are scheduling seminars conducted by Du Pont metal-cleaning specialists. The purpose of these meetings is to give metal fabricators like yourself helpful information about modern metal-cleaning methods and a basis for comparing them.

High point of the seminars is a detailed discussion of Du Pont's new cost-analysis service. This is a method of accounting, based on accepted principles, that helps you determine the complete cost of your present cleaning operation . . . pinpoint out-of-line costs and show how they can be reduced. This new service can help you improve your current operation or help you select the most efficient process if you're planning to expand.

You can get full details about the seminars and cost-analysis service through your distributor of Du Pont "Triclene" D trichlorethylene. He works hand in hand with Du Pont technical representatives to bring you the best metal cleaning available at lowest possible cost. Get in touch with him today, or mail coupon at right.

Answers to questions most frequently asked at the Du Pont cost seminars:

Q. Your cost analysis sounds fine, but how am I going to get the basic information needed? I don't keep a fine breakdown of cleaning costs.

A. We have recently prepared information that will give you all the instructions you need for making a cost analysis. Included are data for obtaining estimates when you need them. Also, Du Pont technical men are always available to help you.

Q. Do all trichlorethylenes have the same effect on cleaning costs?

A. Not at all! "Triclene" D contains an *exclusive* combination of neutral stabilizers that virtually eliminates rejects and permits easier, less frequent degreaser cleanouts. Naturally, these factors have a definite influence on metal-cleaning costs.

Q. Why has Du Pont spent the time and money to establish this cost-analysis service?

A. For two reasons. First, an accurate method for analyzing metal-cleaning costs has long been needed in this field. Du Pont, pioneer of vapor degreasing with synthetic solvents, is in the best position to offer this needed service. Second, we believe that in most cases we can prove to you that vapor degreasing is more economical than alkali washing for metal cleaning. If we can, and if you choose our "Triclene" D trichlorethylene, we *both* stand to profit.

Q. Anything new coming up in vapor degreasing?

A. Yes, indeed. A process now finding commercial acceptance combines degreasing and painting in the same degreaser. A further advance still in the development stage integrates phosphatizing between degreasing and painting.

FOR MODERN METAL CLEANING

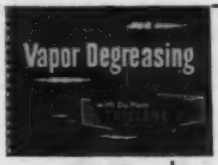
New laboratory houses plant-scale equipment for demonstration and customer service.

New DuPont laboratory helps your distributor provide more service

A phone call to your "Triclene" D distributor will make available outstanding technical service from a Du Pont Solvents Technical Representative. Service that's yours without obligation. What's more, this service is now given extra support by the facilities provided at the new Du Pont Sales Technical Laboratory at Wilmington, Delaware.

Your Du Pont Solvents Technical Representative is up to date on the latest developments in the field. He works closely with your "Triclene" D distributor and together they can keep you posted, provide you with useful literature on improving your metal-cleaning operation. Remember, it's their job to keep your degreasing setup at peak efficiency.

Want more facts about vapor degreasing with "Triclene" D? Free booklet tells how vapor degreasing works, shows types of equipment, points out many cost-saving advantages. Just mail coupon for your copy



cut out and save

Use this handy check list for evaluation of metal-cleaning processes

You'll find the chart below helpful in selecting a metal-cleaning process for your new plant or to replace existing outworn equipment. Engineers who consider all of the factors listed frequently find that the speed, flexibility, quality and economy of vapor degreasing make it the best answer to their cleaning needs. Your local Du Pont Solvents Technical Representative will be glad to help you evaluate vapor degreasing in light of your requirements. You can arrange to have him call through your distributor of "Triclene" D trichlorethylene or through the local office of the Electrochemicals Department. Arrange for a call today!

	VAPOR DEGREASING	ALKALI WASHING	EMULSION CLEANING
SOILS—Can it readily remove?			
1. Stamping and machining oils	Yes	( )	( )
2. Most polishing and buffing compounds	Yes	( )	( )
3. Drawing compounds	Yes	( )	( )
4. Quenching oils	Yes	( )	( )
5. Water-emulsion cutting oils	Yes	( )	( )
6. Shop dirt	Yes	( )	( )
7. Paints	Many	( )	( )
METALS—Can it clean thoroughly without etching?			
1. Steel	Yes	( )	( )
2. Aluminum	Yes	( )	( )
3. Other nonferrous metals	Yes	( )	( )
4. Plastics	Many	( )	( )
OTHER MAJOR CONSIDERATIONS			
1. Fast cleaning action?	Yes	( )	( )
2. High capacity—low investment?	Yes	( )	( )
3. Good penetration into recesses?	Yes	( )	( )
4. Soil redeposition?	None	( )	( )
5. Foaming problems?	None	( )	( )
6. Do parts emerge dry?	Yes	( )	( )
7. Handle all shapes and sizes?	Yes	( )	( )
8. Waste-disposal problem?	None	( )	( )
9. Utility requirements?	Low	( )	( )

E. I. du Pont de Nemours & Co. (Inc.)
Electrochemicals Dept. MF-9, Wilmington 98, Delaware

- ☐ Please send me your booklet on vapor degreasing.
- ☐ Please send me more information on your new cost-analysis method.
- ☐ Please have your representative call for an appointment.

*Name*_____ *Position*_____

*Present method of cleaning*_____

*Firm*_____

*Address*_____

*City*_____ *Zone*____ *State*_____

DU PONT
REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING
. . . THROUGH CHEMISTRY

Rx TREAT ALUMINUM RIGHT with these proven AHCO Compounds

Rx Lustralume No. 1

This outstanding new burnishing compound is a clear stable liquid readily soluble in water. It's non-toxic, non-flammable, mildly alkaline, and moderate foaming. Ideal for use in all conventional types of oblique or horizontal barrels where moderate foaming is permissible. Solutions are free rinsing and leave no undesirable films on the work. Properly cleaned surfaces emerge with a smooth brilliant lustre.

Rx Ahcal Deoxidizer

This compound is ideal for removing smut after cleaning and etching, and before painting. Its convenient powdered form make it safer than liquid acids and it gives off no dangerous or toxic fumes.

Rx Ahcal Etch Cleaner No. 1

This powdered, concentrated, alkaline material produces an attractive, uniform etch in a very short time on all types of aluminum surfaces. It's non-dusty and its solutions produces the right amount of foam. The outstanding characteristic of Ahcal is its ability to dissolve large quantities of aluminum without forming undesirable scale or sludge. As a result maintenance problems are eliminated or alleviated.

Rx Ahcoloid Cleaners

No. 189—A non-etching alkaline soak cleaner for cleaning aluminum prior to anodizing and chemical processing.

No. LC-3—An emulsifiable liquid pre-cleaner . . . ideal for removal of oil, grease, and buffing residues from aluminum. It's non-corrosive and non-toxic.

No. 59-H-5—A non-etching alkaline cleaner for use in power washers. It's low foaming and has exceptional cleaning power.

LUSTREBRITE LIQUID 35—A new type of liquid soak cleaner developed specifically for removing buffing compound residues and fingerprints. It's an aqueous solution of non-toxic, non-corrosive, organic materials. It has no flash or fire point and it's non-fuming.

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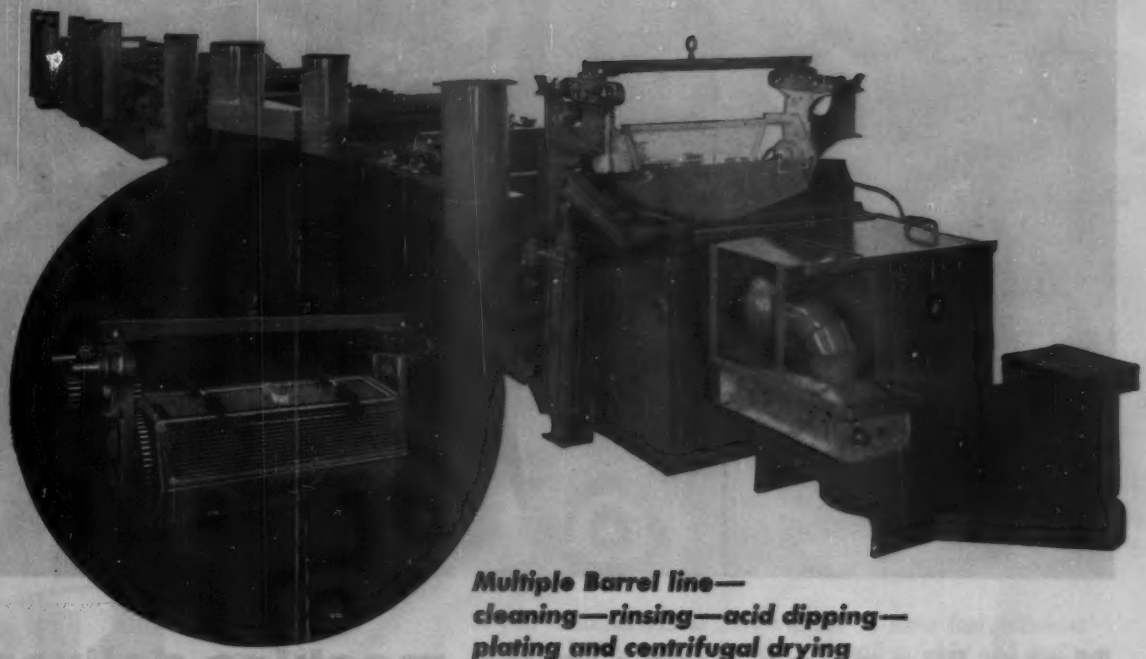
WATERBURY, CONN.

CROWN PLATING BARRELS



Multiple Barrel line—
cleaning—rinsing—acid dipping—
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Can be operated through the entire cycle cleaning—rinsing—acid dipping—and plating solutions.

Whether your production requires a single barrel or a multiple set up for cleaning, rinsing, acid dipping, and plating, there are Crown barrels to fit the job.

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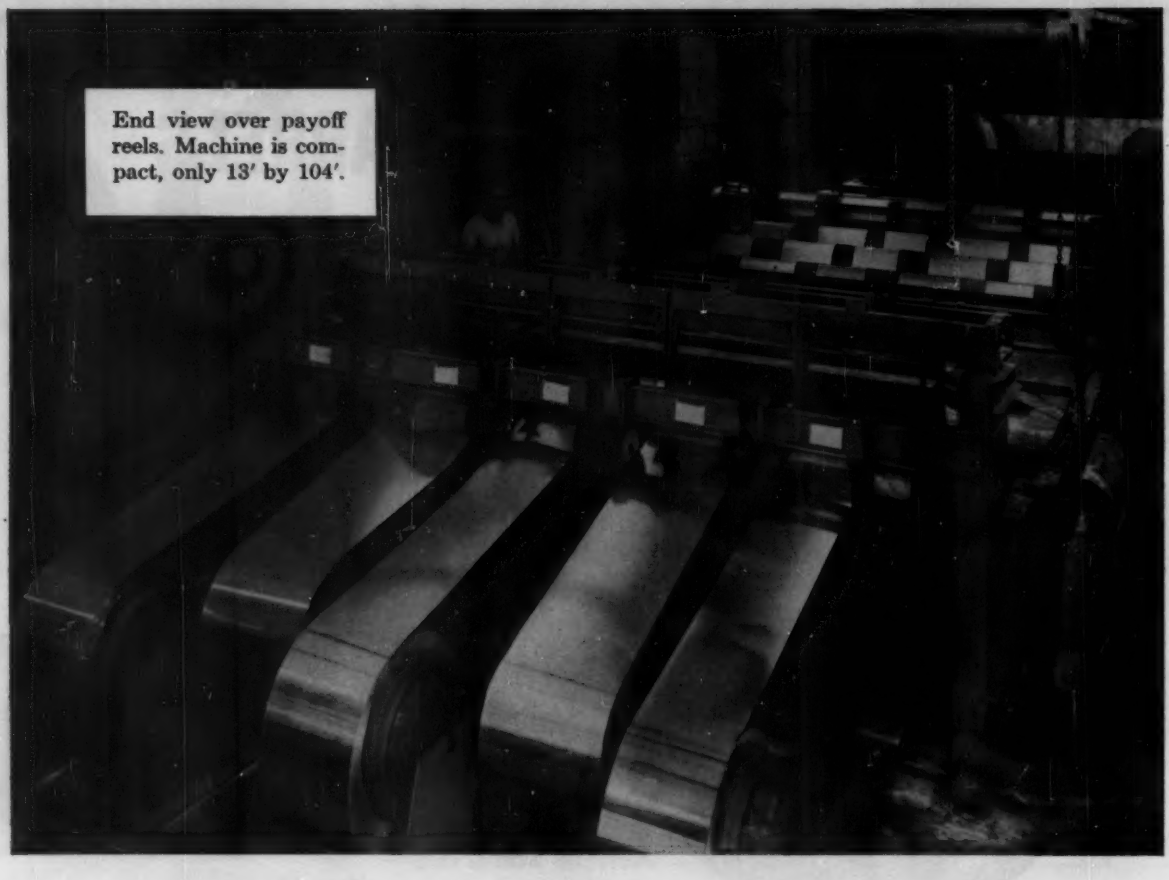


End view over payoff reels. Machine is compact, only 13′ by 104′.

New Meaker Anodizing machine delivers uniform high quality plus versatility

This Meaker anodizing machine was built to meet the requirements of the Allmetal Weatherstrip Company. It handles aluminum strip in widths up to 18″, thicknesses from .0071″ to .032″, and at speeds from 2 to 6 FPM. In the illustration above, five strips are running simultaneously at 3 feet per minute, producing a total of 900 lineal feet of anodized and waxed aluminum every hour.

Meaker engineered and supplied this installation complete with every detail, including: a 6000 ampere generator, refrigerating unit, ice bank, hot air blowers, payoff and take-up reel systems, and the Meaker-built anodizing and wax dip unit itself.

Why don't you take advantage of Meaker's complete service when you need plating and anodizing equipment . . . it's backed by a reputation for building the best for 50 years.

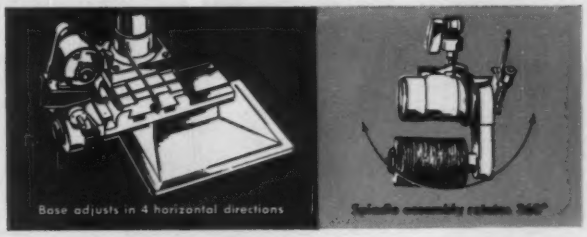
Arrangement of take-up reels allows easy removal of aluminum rolls to forming operations.

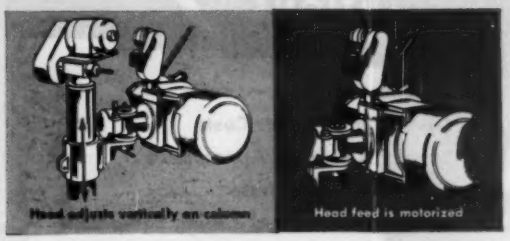
MEAKER

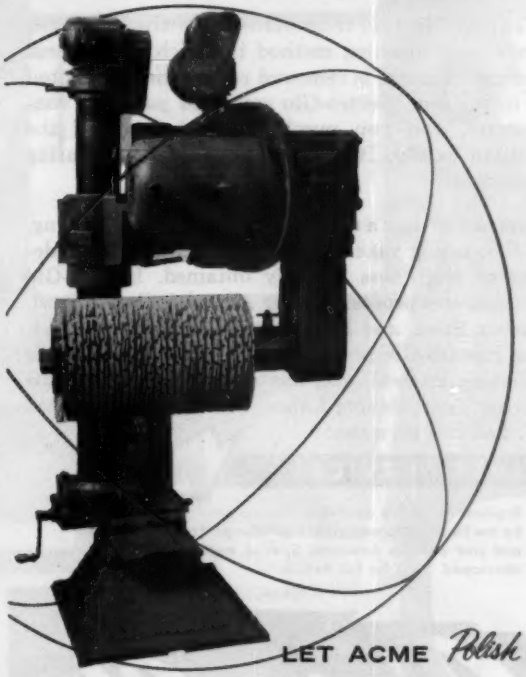
Write for further information

THE MEAKER COMPANY • 1629 S. 55th AVE. CHICAGO 50, ILL.

ACME G-4 KEEPS CONVERSION COSTS DOWN!







If you want machines that will set up for a fast, efficient finishing job on today's work—yet will quickly and easily adapt to next year's designs—ask an Acme engineer to show you the versatile G-4 lathe.

What does the G-4 do? Just about everything! Only four of its many adjustments are illustrated. Without the need for superstructure support, the buffing or polishing head may be faced in four directions horizontally and two vertically. It may be angled to any degree from horizontal to vertical. It may be stationary when it operates, or set for a stroking or oscillating movement. It finishes the most common or the most unusual shapes . . . reduces belt, buffing wheel and compound costs . . . and is ready for adaptation to new designs any time!

An Acme engineering specialist can help you combine these flexible basic units with automatic work-holders or fixtures to give you a set-up for low-cost, high-production finishing. Contact him to discuss your current or anticipated demands. No obligation, naturally.

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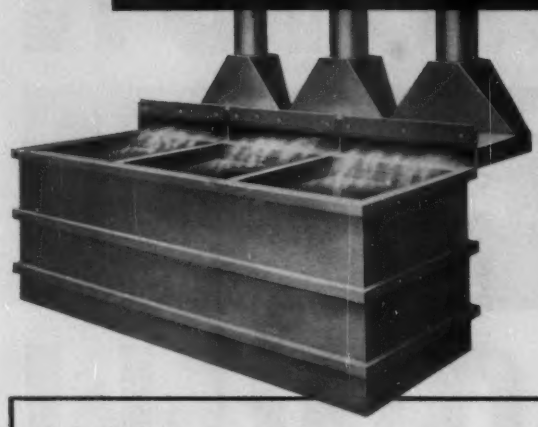

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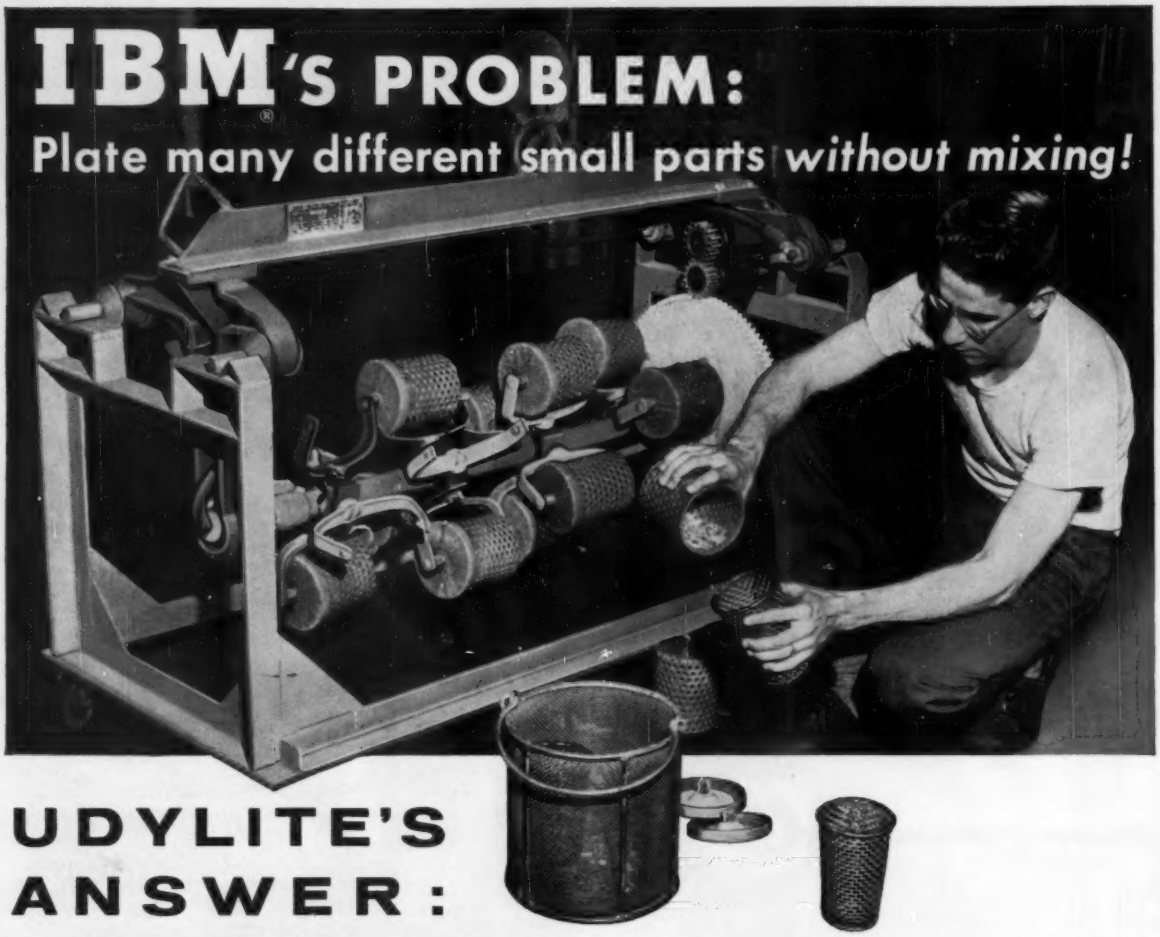
IBM'S PROBLEM:

Plate many different small parts *without mixing!*



UDYLITE'S ANSWER:

CLUSTER BARRELS... for faster, greater production!

At the International Business Machines Corporation, Electric Typewriter Division plant, at Lexington, Ky., many different small parts had to be plated and processed uniformly . . . without mixing. Conventional methods proved too slow, costly and inaccurate. Then, IBM discussed the problem with Udylite.

Out of this discussion came the Udylite Cluster Barrel—developed specifically for the plating and processing of many different minute parts simultaneously . . . *and doing it without mixing!*

Also, because of the gentle tumbling action of the work in each barrel, IBM is now able to plate tiny, fragile parts that heretofore had to be racked, thus saving thousands of dollars each year.

And, the excellent agitation of the solution that results from the orbit struck by each barrel, plus the definite replenishing of the solution makes the Udylite Cluster Barrel the ideal answer for such a problem.

In addition to the multiple cluster illustrated, Udylite now offers 12, 8 and 4 barrel units for plating any number of small and medium sized parts. These cluster combinations are indispensable for anyone engaged in the production plating or processing of business machines, radios, electrical and electronic items.

If processing of small batches or volume plating *without mixing* is a problem in your shop contact your local Udylite salesman now. He can show you how Udylite Cluster Barrels can be *your* answer, too! Call him today or write direct to:

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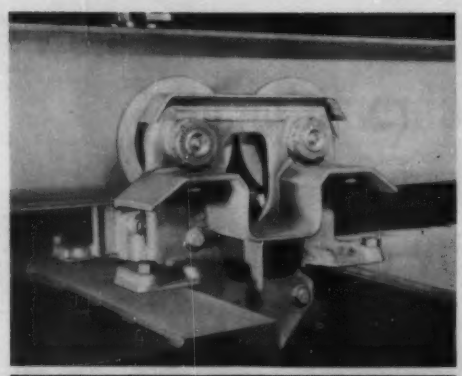

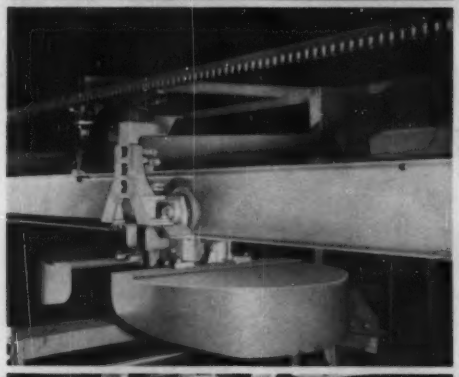

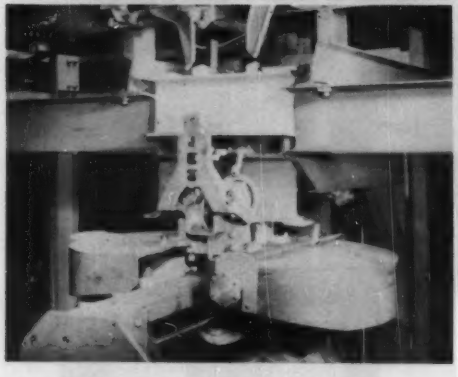

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12 pages, data, close-up photos, diagrams, charts, design drawings; years-ahead automation ready for you NOW!

Solved: The Mystery of the Missing Operators. It's All Detailed in A. P. A. Bulletin 101 . . . (a few photos shown here; brief descriptions below)

(left, top) Inboard side of free-wheeled carrier truck on stationary trackway section. Outboard side (hidden) has "Mechanical Robot" . . .

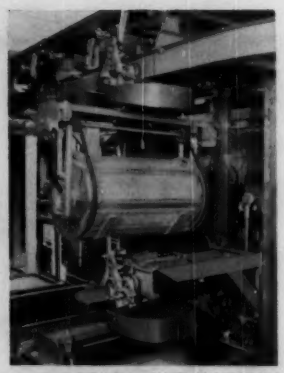
(left, center) Outboard side of carrier in accumulation or feed section. Pusher dog on power chain engaged with carrier to convey to next scheduled destination. Bumpers for accumulation . . .

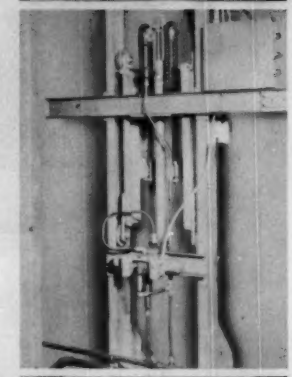
(left, bottom) Outboard side of carrier "locked" on removable main track segment over a station. Interchangeable track segments in process of replacing each other in trackway (up or down). Motor-driven barrel sealed, shielded; Dial Selector (up to 15 cycles) . . .

(right, top) When main track segment lowers with carrier into station, upper replacement track segment drops into main track, "bridging gap" for other carrier traffic (above) to proceed . . .

(right, center) Individual station elevator is standard hydraulic chain lift assembly which raises and lowers carriers at each station . . . activated by fail-safe ABBEY-Matic electro-mechanical controls . . .

(right, bottom) Carrier at point of transfer from ABBEY machine to accumulate and feed area.





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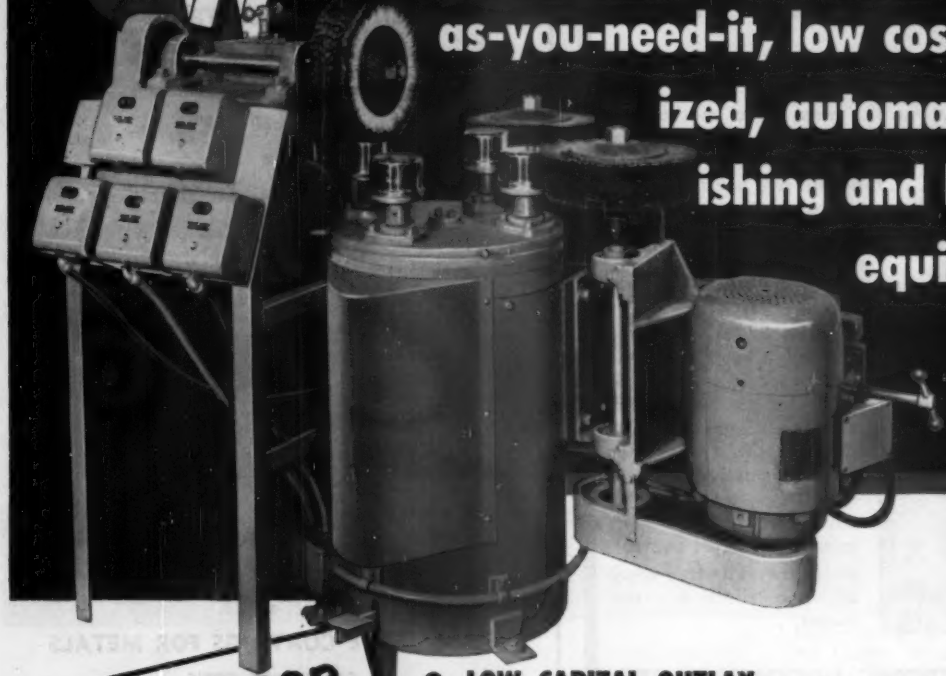

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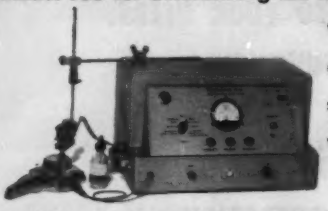
Model 955 for determining the thickness of plating.



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SEPTEMBER, 1958 Volume 56 Number 9

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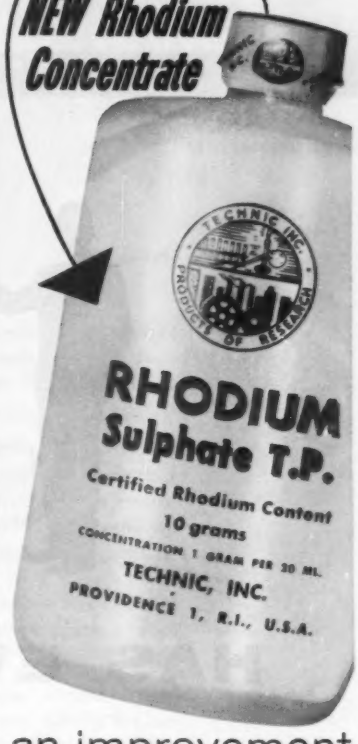

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SPOTS BEFORE THE EYES

Another summer has gone by and, with the advent of cooler, less humid weather, the perennial manifestation of "spotting out" will slowly dwindle to a minimum, recurring only at intervals sufficient to keep the plater from forgetting what will be in store for him again next year.

Beginning late each spring, calls for assistance start mounting but, unfortunately, cyanide spotting has been like the weather — we could talk about it but couldn't do much more. It is the full awareness of the source of this condition, namely small pores in the metal, which has made our inability to come up with a cure after all these years most irritating and embarrassing to the scientific mind. In the old days, brass and bronze castings were placed in a damp place and allowed to spot out, then finished. This, of course, is not feasible with plated surfaces, and many avenues of approach have been considered since plating from cyanide solutions became commercial.

Probably the first treatment based on the exercise of logic was alternate cold and hot rinsing, to expand and contract the solution in the pores, slowly replacing the salt with clean water. However, the bubble burst when some skeptic looked up the coefficients of expansion in a handbook and calculated that, after ten alternate rinses, a good two-thirds or more of the salts would still be holed-up in the pores. On the theory of neutralizing the cyanide and other alkalies, various mild acid dips have been suggested and tried over the years, including every organic and inorganic acid which would not attack the metal surface. However, since the minute holes were already filled with solution, access of the acid was blocked and, although platers sometimes swear by the effectiveness of these dips, it is more likely that the results obtained were due to a run of less porous metal and a dry climate. Slight amelioration in spotting out has been obtained by the use of chromate dips and phenolic lacquers, and both wetting agents and chelating materials have been claimed to be effective, but none promise complete relief.

So far, we haven't been very helpful. However, two courses of action are open which, although not guaranteed cures, have proved to be the most effective to date in minimizing spotting out. The cavitation produced by ultrasonics is well-known to drive out packed dirt from blind holes during cleaning and degreasing. It dawned on a number of progressive finishers that the principle, employing water or alcohol, should also be applicable to salts entrapped in pores, and this has been confirmed in practice. The cost of the necessary equipment will limit adoption of this method in many cases, especially where large parts are being processed. Nevertheless, it appears to be the best procedure ever suggested. For those who have baking facilities, the next best alternative is to hold the plated parts at about 225°F. for 15 minutes. This serves to dehydrate the pores and, if the baked articles are given a good coat of lacquer immediately after cooling down and before the hygroscopic salts have the opportunity to absorb more moisture from the air, spotting out is effectively minimized.

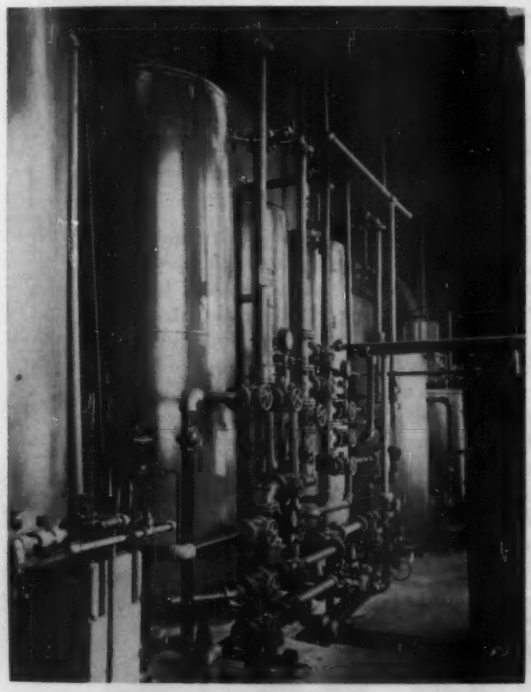
Nathaniel Hall

Recovery or Disposal of Plating Wastes?

By R. J. Keating, *Graver Water Conditioning Co., 216 West 14th Street, New York 11, N. Y.*

WHENEVER industrial wastes must be treated in order to comply with local control regulations or to maintain good community relations, it is a matter of self-interest to both industry and community to procure required treatment at the lowest possible cost. Modern waste treatment techniques frequently include recovery of product, water, and heat values as a means of reducing the net cost.

Within the last few years, increased use of ion exchange equipment in plating rooms has made possible the recovery of valuable constituents which previously were removed from waste streams and destroyed to meet legal requirements. Toxic plating chemicals are often present in plant waste because of drag-out from the plating baths to running rinses, or from dumping or "bail-out" of the plating baths because of contaminant build up.



Ion exchange system for treating plating wastes.

Ion exchange processes used for recovery include: (1) hydrogen cation exchange for anodizing and chromium plating bath purification; (2) anion exchange for recovery of chromates, and (3) hydrogen cation-anion exchange for recovery of water and other valuable materials. Batch and continuous disposal systems usually involve oxidation or reduction of toxic chromates and cyanides, followed by precipitation of the hydroxides or other insoluble salts of the various heavy metals.

Determining Factors

Since both of these methods are now widely accepted in industry, a comparison should always be made to discover which one will provide optimum treatment for individual cases. As in the solution of all waste treatment problems, the economic factor is of primary importance; however, there are other important factors to consider. The major ones are as follows:

1. *Regulations affecting plant discharges.* Chemical precipitation may not reduce concentration of toxic wastes to limits prescribed by certain stringent regulations. Unless there is enough uncontaminated dilution water available, an ion exchange system may be necessary to meet pollution requirements.

2. *Use and value of recovered chemicals.* Although desirable, it is not always necessary for recovered materials to be returned to the system. For example, one plant recovers chromates by precipitation with a barium salt, recovering barium chromate as a by-product. This can be sold to the paint industry as a pigment.

3. *Use and value of recovered water.* Use of demineralized water in rinsing operations substantially reduces the number of rejects from staining of deposits and minimizes final finishing operations. It also prevents introduction of undesirable chemicals and contaminants into the plating baths during make-up for evaporation losses.

4. *Installed cost of equipment.* Recovery equipment is usually more expensive than disposal equipment in original cost. The differential increases at larger flows, but recovery value also increase. Maintenance and operating attention are usually the same for both systems.

5. *Available space.* Ion exchange requires much less space than other types of disposal systems. When space is at a premium, this may be a major factor in choosing a system.

6. *Flow conditions within the plant.* In a new plant, it is usually desirable to segregate chromate wastes, general wastes, and cyanide wastes for separate treatment. However, when a waste treatment system is to be added to an existing plant doing several types of plating, recovery is not economically feasible unless it is possible to segregate the rinse streams.

Case Histories

To discuss and contrast the economics of recovery and disposal, and also to show how determining factors come into play in the selection of a system, three actual case histories are presented below. Flow rates have been adjusted to the same value in order to simplify discussion in this article.

Plant "A" produces approximately 100 gallons/minute of waste water from its anodizing process. The waste water contains approximately 40 parts per million chromic acid plus solids from the city water makeup. Municipal regulations compelled the plant to install equipment for removing chromium from the waste before disposal to a nearby stream.

Location in a relatively congested area put space at a premium for Plant "A". Two methods of treatment were considered: precipitation-disposal by a continuous flow-type system or ion exchange for the recovery of water and chromic acid from the rinse stream, including treatment of the anodizing bath itself to eliminate the need for bath dumping. The continuous disposal plant consisted of pH adjustment equipment and chemical feeders, a reduction tank and a solids-contact clarifier. Sodium meta-bisulfite under redox control would be fed to the reduction tank, followed by pH adjustment with lime. Chromium would be precipitated in the clarifier.

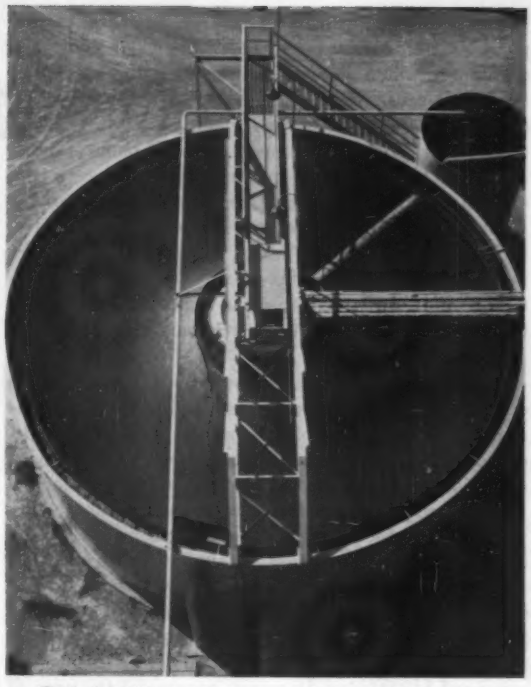
Cost of Continuous Disposal Plant:

The installed cost for this type of equipment would have been approximately $41,000 including foundations, erection and wiring. The system would have occupied 400 sq. ft. of floor space. Chemical operating costs for lime, sodium meta-bisulfite and sulfuric acid would amount to approximately $4.35/day at the prevailing prices. With a system of this type, it was not feasible for this particular plant to recover treated water because of the relatively high dissolved solids content of the treated water and the need for a low solids rinse water.

With the plant operating 16 hours a day, five days a week, the resulting loss in water would have amounted to approximately 96,000 gallons per day, at a cost of 10¢/M gallons, or $9.60 per day for water. The net operating cost for this plant, not including maintenance charges, floor space required, amortization of equipment and operating attention, would have been $9.60 for water plus $4.35 for chemicals or a total of $13.95 per day.

Cost of Ion Exchange Plant:

Plant "A" selected an ion exchange system. Based on the prevailing prices in the area, chemical operating costs, including cost of demineralized water makeup and replacement of resins, amounted to $7.65/day. The water returned to the system at 10¢/M gallons was $8.65/day. In this case there was a net operating credit, not including maintenance charges, space required and amortization of equipment, of $10.30/day for the ion exchange plant. Advantages, including net operating credit, small space requirement, high quality demineralized water, no need for dumping or bail-out and a saving of $35/day on expensive bath solutions, offset the initial investment premium of $6,000 which Plant "A" had to pay. Fig. 1 is a flow diagram of the ion exchange plant selected.



Typical clarifier treating wastes at Eastern industrial plant.

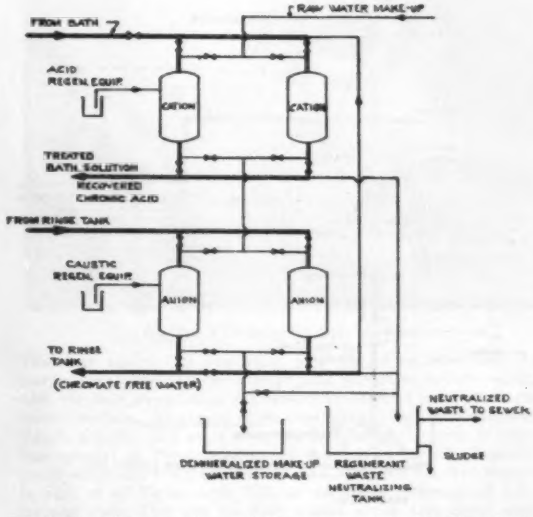


Fig. 1. Flow diagram of ion exchange system selected by Plant "A".

The waste stream from Plant "B", a general plating plant, contained cyanides, copper, nickel, zinc, and chromium, which were objectionable to the regulatory agency. Because of the plant layout, it was not feasible to separate the plant waste streams of chromium and cyanide for separate treatment, as would be most desirable. Two types of waste treating equipment were considered: continuous disposal, and ion exchange for the recovery and re-use of water. Because of the concentration of cyanides in the waste, it was felt that water recovery would not be feasible. Nevertheless, an economic study was made to clearly illustrate the difference in costs of the two types of plants.

The water recovery system would have consisted of a cyanide oxidation plant and a demineralizer for the removal of dissolved solids from the waste water. Because of the relatively high concentration of cyanides, oxidation with chlorine under pH and redox control would be required. For this recovery treatment method, the installed cost would have been approximately $63,500 including foundations, piping and wiring. The equipment would have required approximately 470 sq. ft. of floor space. It would be capable of returning approximately 86,000 gallons of demineralized water to the system, valued at 15¢/M gallons or a total recovery of $12.90/day. However, because of the need of adding chlorine and caustic for cyanide oxidation ahead of the demineralizer, the quantity of dissolved solids removed by the demineralizer would be very high. Chemical operating costs would be about $118.90/day.

With a precipitation-type plant, the installed cost was approximately $57,500, with chemical operating costs amounting to $34.70/day. No water was returned to the system. Operating attention and maintenance requirements were about the same as for ion exchange, and the same sludge disposal equipment was required. Because of the substantial difference in initial installment costs and operating costs, Plant "B" selected a precipitation-type system, as shown in Fig. 2.

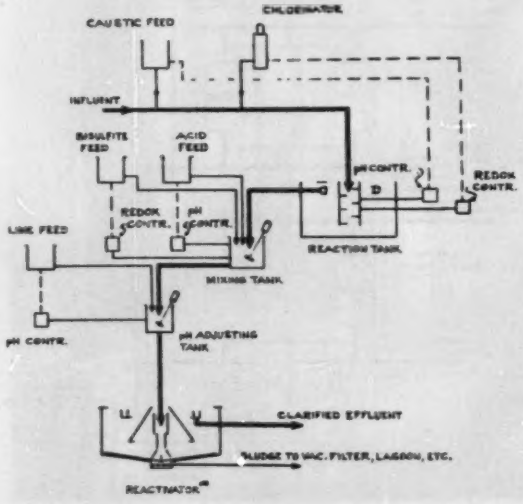


Fig. 2. Flow diagram of recovery system selected by Plant "B".

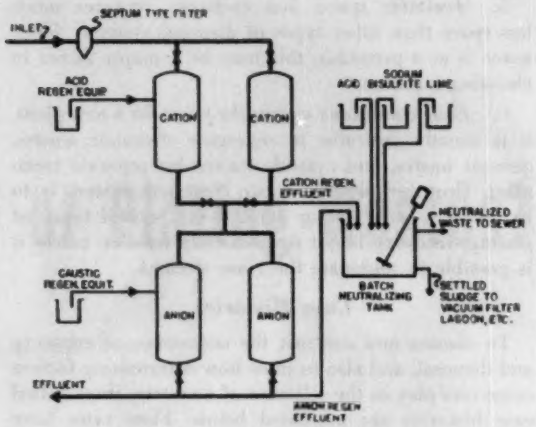


Fig. 3. Flow diagram of ion exchange system selected by Plant "C".

General Plating Plant Without Cyanides

The same equipment as considered by Plant "A" was evaluated for Plant "C". The continuous disposal-type plant would have resulted in a chemical operating cost of approximately $8.10/day, including the cost of sulfuric acid and sodium meta-bisulfite for chromium reduction, and lime for the precipitation of the metals under pH control in a clarifier. With this plant, there would be no water returned to the system, so the operating cost, not including amortization, maintenance and operation attention, would have amounted to approximately $8.10/day.

With the ion exchange treating plant, the chemical operating cost amounts to approximately $14.60/day. This includes cost of caustic and sulfuric acid for the regeneration, for the reduction of the hexavalent chromium, and of lime for the precipitation of metals concentrated in the regenerant effluent. At this particular location, makeup water costs were somewhat high, amounting to 20¢/M gallons, so that the water value returned to the system from the ion exchange units is $17.30/day, for an operating credit of $2.70/day for the water recovery system.

This plant selected ion exchange recovery in spite of the equipment premium of approximately $6,000 for the following reasons: (1) an operating credit of $2.70/day as opposed to an operating cost of $8.10/day; (2) smaller space required; (3) advantage of demineralized water in plating operations, and (4) operating simplicity of small batch disposal plant required. A flow diagram of the ion exchange system selected is shown in Fig. 3.

Summary

Both ion exchange and chemical precipitation are accepted methods of solving plating waste problems. Choice of the one, or a combination of both, best suited to a given plant depends to a great extent on the factors discussed in this article. The important point is that mere knowledge of these factors will not solve the problem. It is the proper evaluation of these factors that will indicate which system is best for the plant in question.

Thermal Shock Resistant Nickel Plating on Copper

By L. Missel, *Lockheed Missile Systems Division, Van Nuys, Calif.*

AT exceedingly high velocities the heat generated by air friction causes rapid deterioration of the surface of copper parts. The use of this metal was functionally of great value, and an investigation was therefore undertaken to provide protection for the copper under conditions of thermal shock.

Lockheed Missile Systems is currently engaged in the production of the Air Force X-17 re-entry test vehicle (Fig. 1), the Navy Polaris IRBM, and other classified projects. It was recently announced by Air Force General *Bernard Schriever* that Lockheed is working on a giant earth reconnaissance satellite.

It was obvious that a thin, hard, resistant outer coating was needed to extend the useful life of the copper parts. This coating required excellent adhesion through exceedingly abrupt temperature changes of great magnitude as well as good environmental resistance. Such a pit-free surface, capable of being taken to an extremely high polish (1 micro inch RMS), was found to provide the optimum protection.

Preliminary evaluation was performed by subjecting samples to thermal shock in a solar furnace (Fig. 2). This operation consisted of focusing the sun's rays, reflected from a 60″ parabolic mirror on a clear, sunny day to a spot of ⅛″ diameter on a small prepared sample disc (Fig. 3). Because of temperature gradients and the small area of heat application, absolute local temperatures are difficult to obtain. However, despite the great heat absorption due to the great bulk of the disc in comparison with the small heat affected area, it is possible to melt the copper through a 0.007″ coating of nickel in 10 seconds.

The thermal shock resistance of the final plating system developed was exhaustively checked by this method but, even more important, a large number of plated parts were used and found in practice to furnish excellent protection against their environment. This plating was used on components of Lockheed-built research missiles.

Experimental

Solar furnace tests were performed by *Freeman Hall* on a large number of metallic and ceramic coatings. These coatings were applied over ½″ round by ⅜″ thick pure copper discs, the metals by electroplating, and the ceramics by spray techniques. The ceramics were all inherently porous, resulting in blistering and lifting of the coating. Of all the materials checked, nickel showed the most promise; however, conventional plating techniques did not produce deposits which would withstand solar furnace shock.

An investigation to provide a nickel plate meeting the abovementioned requirements was begun. The conclusions reached were as follows:

BASIS METAL:

1. Available commercial coppers (including oxygen-free, tough pitch and vacuum melted) contain a large amount of porosity and inclusions.

2. Detection and repair of areas with surface inclusions or porosity must be performed very thoroughly to prevent pits in the electrodeposit.

3. The use of oil or other water-soluble material during fabrication is a prime cause of pitting.

Fig. 1. X17 Re-entry Test Vehicle.

This first vehicle for evaluating problems of re-entry into the earth's atmosphere is a three-stage solid propellant ballistic missile with the first stage taking the vehicle hundreds of miles above the earth's surface. The second stage developing 1,500,000 horsepower thrust, and the third stage drive the vehicle toward earth at fabulous speeds. In flight telemetered information includes velocity, acceleration and temperature data. The Air Force reported success in 92% of all flights, with 70% of all flights returning all telemetered data. This was the first missile whose nose cones were successfully recovered.

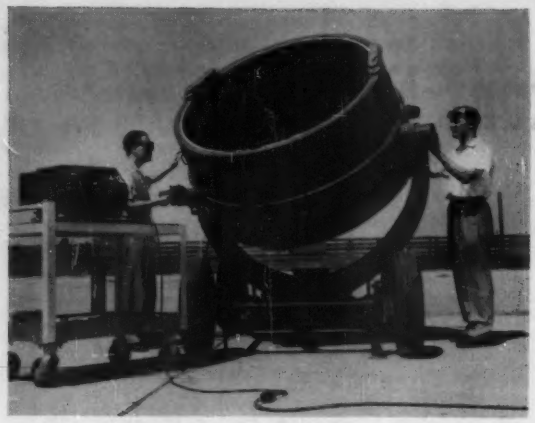


Fig. 2. Solar Furnace.

PREPARATION FOR PLATING:

1. Brush plating, using copper sulfate or proprietary brush plating copper solutions is satisfactory for repairing surface defects, such as those caused by machining, or removal of inclusions or porous areas.

2. Preparation for plating by buffing and polishing leads to pits in the plate, and to inferior adhesion under thermal shock.

3. Sanding of the copper with No. 600 emery paper before plating minimizes pitting and increases adhesion.

NICKEL PLATING:

1. Nickel plated from a low stress sulfamate bath is less sensitive to thermal shock than nickel plated from the Watts or other common baths.

2. Of the large number of surface-activating solutions investigated, a mixture of 5% acetic acid and 5% hydrogen peroxide (30%) by volume had outstanding ability to promote adhesion and minimize pitting of the subsequent plate.

3. Solar furnace tests, as well as experience in use, showed that a thin copper strike from a cyanide bath over the prepared surface has no adverse effects. While not essential on exceptionally high grade copper, it was of value in minimizing pitting over most of the copper obtainable.

4. By meticulous care with defect detection and repair, surface preparation, protection from oil and other undesirable fluids, good plating technique, and the use of clean, well maintained chemical baths, adherent, pit-free plate can be obtained consistently.

THE PLATED SURFACE:

1. Conventional nickel plating techniques do not produce the thermal shock-resistant and high quality, pit-free plate required.

2. Under solar furnace conditions, when taken above the melting point of copper, alloying of the nickel plated by this procedure with the copper base takes place. (Fig. 4) Cupro-nickel alloys are well known to have extremely desirable physical characteristics. There is no evidence of failure of adhesion under these conditions.

3. The low stress sulfamate nickel comes from the bath with a 10-15 micro inch finish in a soft, easily buffable condition. When buffed and polished to the required finish, it work-hardens to provide hardness for environmental resistance.

4. Tests conducted by Mr. Hall indicate nickel to have reflectivity considerably greater than that of copper at elevated temperatures.

Procedure

1. The part is soak cleaned in alkaline cleaner for a minimum of 3 hours at 150°-160°F.

2. The part is masked and then completely sanded with No. 600 emery paper.

3. The part is alkali soak-cleaned at 130°-140°F. A characteristic deposit over defects indicates need for repair.

4. Fluorescent penetrant inspection as follows is desirable, though not absolutely mandatory at this point.

(a) A 1:3 solution of water soluble penetrant is applied with a camel hair brush.

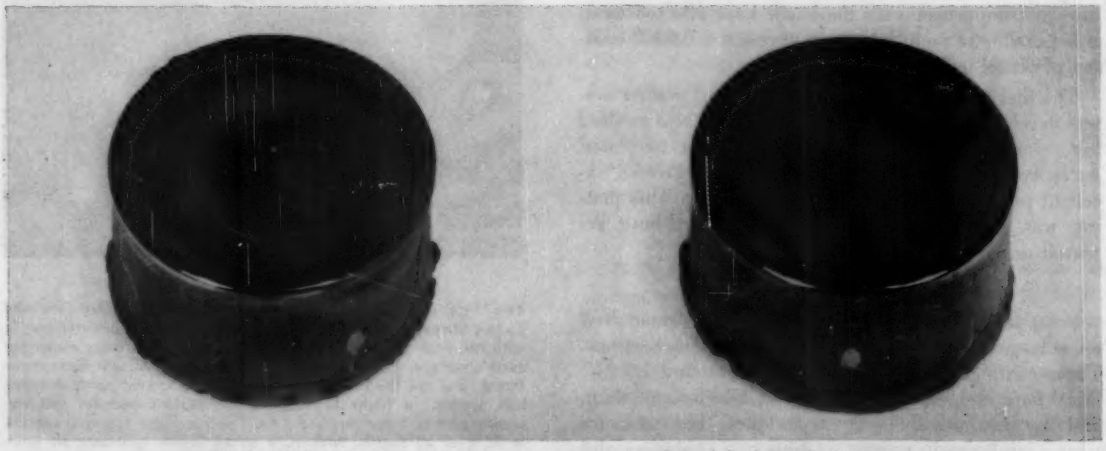


Fig. 3. Nickel plated copper test discs after exposure to thermal shock in solar furnace.
Left—0.007" Watts nickel, 2 seconds exposure. Right—0.007" Sulfamate nickel, 8 sec. exposure.

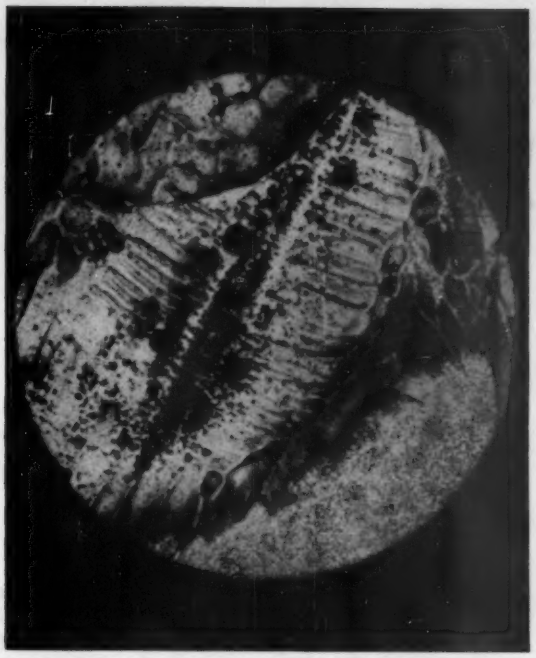


Fig. 4. Photomicrograph of nickel-copper interface after solar furnace exposure to above melting point of copper. Note dendritic structure in copper caused by fusion and alloying between copper base and nickel plating. X1,000.

(b) ½ hour penetration time at room temperature is allowed.

(c) The part is thoroughly wiped with a damp cloth under ultra-violet light to remove surface penetrant.

(d) Developing powder is dusted over the entire surface and allowed to set for 15 minutes.

(e) Visual inspection with ultra-violet light is performed.

5. Any defective area is marked off. A careful visual inspection, using a 10X hand lens, is made to locate any additional minor defects, and any such defects found are marked off.

6. Inclusions are removed with a probe, and the hole cleaned and extended to make it suitable for brush plating.

7. Pores are opened and cleaned and prepared for brush plating.

8. Machining defects are cleaned and prepared for brush plating.

9. All areas not requiring repair are covered with pressure sensitive vinyl electroplaters tape.

10. Each defective area is repaired individually by cleaning, activating, and copper brush-plating.

11. After all areas have been repaired, the vinyl tape is removed.

12. The part is given a final sanding with No. 600 emery paper.

13. The part is anodically cleaned.

14. The part is thoroughly rinsed.

15. The part is immersed for further cleaning and activation in the following:

Acetic acid, glacial	190 ml.
Hydrogen Peroxide 30%	190 ml.
Distilled or Deionized Water	to 1 gallon
Temperature	Room
Time	1 minute

16. The part is thoroughly rinsed.

17. The part is lowered into the following solution. After 10 seconds the current is turned on.

Copper (as metallic copper)	1.5-2.1 oz./gal.
Sodium cyanide (free)	1.3-1.5 "
pH (adjusted with sodium hydroxide)	12.0-12.6
Anodes	Bagged, rolled or cast electrolytic copper
Temperature	100-110°F.
Time	3½ minutes
Current density	75 amp./ft.^{2}

18. The part is thoroughly rinsed, then immersed in 10% sulfamic acid for 5 seconds.

19. The part is quickly rinsed and lowered into the nickel bath.

20. The cathode rocker is started.

21. The part is struck at 100 amp./ft.^{2} for 5 seconds, and the amperage lowered smoothly to 50 amp./ft.^{2}. The part is plated as follows:

Basic Formulation — Proprietary sulfamate nickel plating solution (Purified and ready to operate.)

Density	30.0-31.5° Baumé
Boric acid	4-5 oz./gal.
pH	3.0-3.5 (electrometric)
Surface tension	80-120% of basic formulation
Stress reducer	None
Anodes	Bagged 99% plus, rolled, depolarized nickel
Temperature	128-132°F.
Current density	50 amp./ft.^{2}
Deposition rate	0.002"/hr./side
Time	3½ hours
Agitation	Cathode rocker

22. The part is removed from the bath and rinsed thoroughly.

23. The masking and fixturing are removed.

24. The part is rough buffed with Al_2O_3 abrasive compound.

25. The part is cleaned to remove abrasive.

26. The part is "colored" with white lime coloring compound.

27. The part is cleaned to remove abrasive.

28. The part is hand polished with successively finer diamond compound and special polishing cloths.

29. Rework of small pits, if present, can be performed by electrolytic cleaning, anodic activation with 10% sulfamic acid, and brush plating with nickel sulfamate plating solution. This is rarely necessary.

Acknowledgement

The author wishes to acknowledge the valuable help and suggestions of *Tom F. Vajda*. This work was done at and for Lockheed Missile Systems Division, with whose permission this material is being published.

Plating Room Layout

By G. R. Kentta, *Process Engineer, The Udylite Corp., Detroit, Mich.*

ELECTROPLATING as a final finish on manufactured items, whether functional or decorative, has been used in industry for many years. Decorative electroplated finishes on costume jewelry, lighting fixtures or automotive parts has a great influence on the sales appeal of the products. Because of the versatility of electroplating, industrial designers have the opportunity of incorporating more intricate designs in the various components of products. Also, it permits them to use plated steel, brass and zinc diecasting components on the same products and produce the same appearance on all of the items.

Prior to World War II, the industry in general considered its electroplating departments a necessary evil. Little or no investment was made to modernize antiquated equipment or methods. As a consequence, plating procedures remained haphazard, resulting in unsatisfactory and expensive plating operations.

At the outset of World War II, thousands of unheard of ordnance items required an electroplating finish with rigid specifications. Items such as shell cases and fuse components, formerly made of brass, were converted to steel construction for which suitable plated finishes had to be developed. In many cases special equipment had to be developed to plate to rigid specifications parts for ordnance, aircraft, etc. These contributions of the electroplating industry during this period were tremendous and its importance was rapidly recognized by leaders of industry.

After the war, industry, as it returned to civilian production and where electroplating was used on its products, immediately made plans to replace antiquated equipment with modern and more efficient plating methods. The type of equipment purchased depended upon production requirements, the size of parts to be processed and the various types of electroplating finishes needed.

The electroplating industry is unique in that, in every plating department, one must consider chemical, electrical, and mechanical problems.

Plating departments may be classified under the following general categories:

1. Still tank cleaning and plating
2. Still tank cleaning and semi-automatic plating
3. Trolley hoist systems
4. Full automatic cleaning and semi-automatic plating
5. Full automatic cleaning and plating

Still Tank Operation

Where maximum flexibility in a plating department is required and production is small, still tank operation is indicated. This permits any combinations of cleaning cycles and plating processes to be combined in the same system. The number of cleaning, rinse, and acid tanks required will depend upon the various types of basis metals to be processed. In still tank operation, the operators can adjust the timing in the various processing solutions to suit varying conditions. Since the greatest percentage of people are right handed, still tank plating departments should be provided for right hand operation; that is, the flow of work should be counterclockwise. This permits the operators to carry racks with the least amount of effort.

If floor space permits, a U shaped layout (Fig. 1) is recommended. With this type of system, the start of the plating process and its completion takes place in the same vicinity, that is, at the racking and unracking bench. This will result in a minimum amount of walking, which is important in still tank operation. A straight line still tank layout has the disadvantage that the racks, whether loaded or unloaded, must be returned to the head of the cycle. It will be necessary to return these racks by a monorail system, carts, or by hand. In any case, additional labor or equipment is involved.

Where a plating department is required to produce more than one plated finish upon more than one type of basis metal, a common L shaped cleaning line (Fig. 2) containing the necessary cleaner, acid, and rinse tanks is recommended. The various plating operations, with their auxiliary tanks, would be placed parallel to it to complete the return cycle.

The plating room should be laid out so that it will not be necessary to carry racks across aisles after any operation except a water rinse. This will avoid dripping the various plating room solutions on the flooring and the operator's clothing.

The operation in a plating room should be continuously forward. Backtracking of racks in order to use

common rinse tanks creates contamination, resulting in plating difficulties.

The location of water, steam, bus and ventilation lines should be along the backs of the tanks. Free passage of racks from tank to tank is strongly recommended in order to minimize the operators' efforts.

The efficiency of a hand-operated plating department is dependent upon the efficiency of the operators. In laying out a hand-operated plating department, it is good judgment to conserve the operators' energy as much as possible. Besides maintaining a continuously forward operation, the tanks should be sized for progressive operation. That is, space should be provided in all multiple-station tanks for one more rack than is necessary for its required process timing. Racks of optimum size will be processed one at a time at a definite rate in order to maintain a definite flow of production, and assuring the necessary processing time throughout the entire cycle.

In this system a rack is placed in a vacant space in a processing tank and one that has completed its process timing is removed for further processing. Batch operation of still tank departments creates confusion and prevents the uniform and continuous flow of production.

The number of rack spaces required for a processing tank can be calculated easily. For example, at a process time of 12 minutes at 50 racks per hour, the number of racks required in the tank at all times is 12/60 x 50 or 10 racks. Allowing for one open rack space, the tank should be sized for 11 rack spaces.

Sizing of Racks

The size and weight of racks used in still tank operations vary greatly from plant to plant. As mentioned above, the "personal element" in still tank operation greatly influences the productivity and quality of the product. Since still tank operation is entirely manual, the factor of personal fatigue must be taken into consideration when the size and weight of the racks to be processed are to be determined.

The length of a man's arm and the height of the tanks above the flooring (duckboards) in many cases will determine the practical depth of the racks. The recommended height of tanks above the flooring should be approximately 30". Tank heights much less than 30" above the duckboards become hazardous due to the fact that a deep reach may cause the operator to lose his balance. A rack depth of 30-36", including the rack hook, for still tank operation is practical, safe, and non-

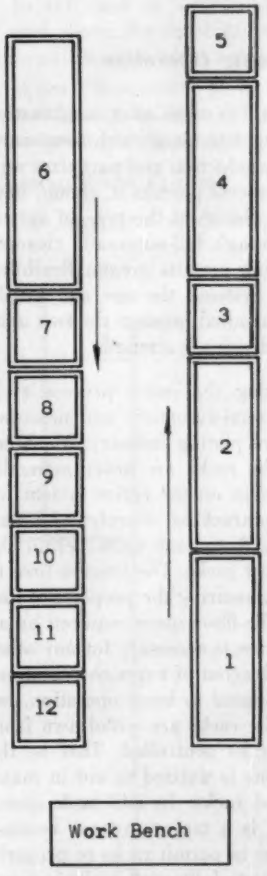


Figure 1

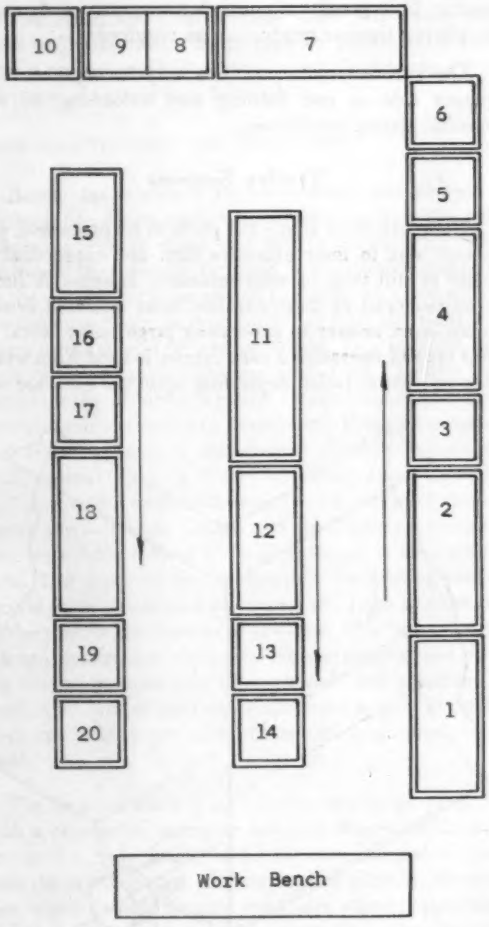


Figure 2

fatiguing. The length (dimensions parallel to tank rods) of racks to be used depends upon the total weight of the loaded rack. With light stampings, a rack length of 12-18" can be processed conveniently by an operator. Processing of castings may restrict a 34-36" deep rack to a length of 8-10" because of the excessive weight.

The thickness of a loaded rack will determine the anode-cathode dimensions of the electrocleaning and plating tanks. This dimension must be sufficient to permit the operator to conveniently place and remove racks from tanks without the danger of knocking parts off the racks.

Semi-automatic Operations

When the production or plating time is such that a large still tank or several smaller ones are necessary to meet the requirements, semi-automatic plating equipment is suggested. This type of equipment has an advantage in that it decreases the amount of necessary walking, serves as a pace maker, and assures the same plating time for each rack.

The transfer mechanism of a semi-automatic machine is usually accomplished through the plating tank by a link chain driven by a variable speed drive and motor. This permits a controlled increase or decrease in plating time or production as required.

The semi-automatic machine may be engineered to permit side or end loading and unloading, to suit specific plating conditions.

Trolley Systems

There are cases where the parts to be processed, primarily due to their excessive size, are impractical to plate in still tank or semi-automatic systems. A batch type monorail or double-trolley hoist operated system often is an answer to processing large bulky work. In this type of operation a rack carrier is used from which one or several racks, depending upon the size, are suspended. These carriers usually vary from 10'-30' in length. The longest part to be processed determines the length of the carrier. It naturally follows that all of the tanks must have the same dimensions to suit the rack dimensions on the carrier. Where increased process timing is required, tanks can be built to accommodate more than one rack carrier. The tanks usually are placed side by side or end to end depending upon the tank sizes and floor space available.

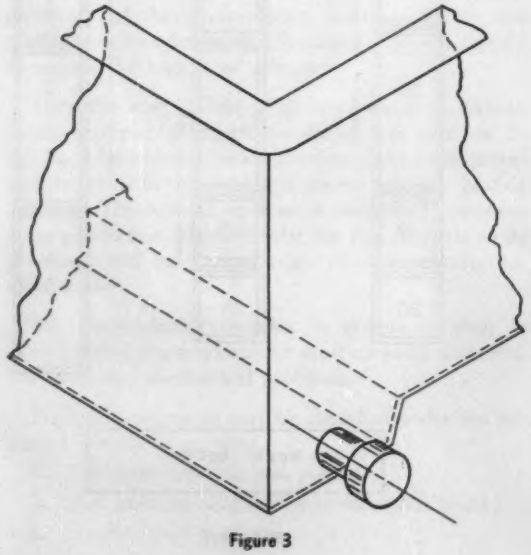


Figure 3

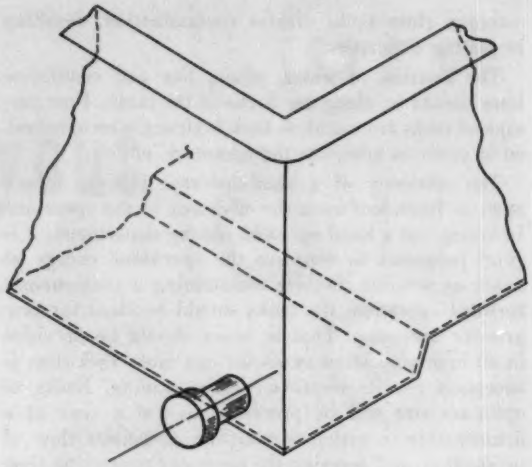


Figure 4

Full Automatic Operation

Complete fully-automatic systems or a combination of full-automatic cleaning combined with semi-automatic plating, where the production and part sizes warrants it and the plating process permits it, should have first consideration in the choice of the type of system to be decided upon. Although full-automatic cleaning with semi-automatic plating permits greater flexibility than complete automatic systems, the size and weight of racks to be manually handled between the two units must be limited to the individual's strength.

Automatics incorporating the entire process cycle have replaced still tank, semi-automatic and monorail systems through the entire plating industry. Machines have been built where the racks are never manually handled, that is they remain on the entire system for processing, racking and unracking, therefore increasing the life of the racks. Automatic units permit the use of very large and heavy racks. The process time in each operation is specific, assuring the proper cleaning and plating operations. The floor space required by an automatic system is less than is necessary for any other type of installation. The dragout of expensive solutions is greatly decreased, compared to hand operation, because the rate at which the racks are withdrawn from the various solutions can be controlled. That is, the surface tension of solutions is utilized to aid in maximum solution-stripping of racks. In still tank operation, dragout of solution is a major expense because operators do not take time to permit racks to properly drain. The possibility of parts falling off racks is greatly reduced because the rate at which the racks enter

the various solutions can be controlled, thus avoiding knocking or floating of parts off racks.

General Considerations

In laying out a plating department, whether it is to be for still tank, trolley hoist, or fully automatic operation, many details must be considered before the final decisions are made.

PROCESS CYCLE:

It is true that 85-95% of all plating difficulties are due to a combination of improper cleaning of the basis metals and insufficient rinsing. Before the process cycle has been decided, one must be absolutely sure that the necessary number of cleaners, acids, and rinses have been included, and with the required time. The worst condition of the basis metal to be plated must determine the nature of the cleaning cycle.

The above is especially critical in determining the cleaning cycle for full-automatic machines. Once the machine has been built, any necessary additions to its cleaning cycle is very expensive not only in machine changes but also the cost of production losses, which could be monumental. It must be remembered that a full-automatic machine is quite inflexible. Insufficient time in any single process tank could make it necessary to decrease the production (racks per hour) of the machine to obtain satisfactory work.

In still tank or semi-automatic operation, as mentioned above, the flexibility of the manual system permits adjustments when necessary.

When the cleaning cycle is correct in any plating system, generally, little difficulty is encountered in the subsequent plating operations.

PLATING ROOM FLOORS:

The floor upon which the plating equipment is to be placed should be constructed and protected for long life. The concrete flooring and piers should be thick enough to support the weight of charged tanks. Rinse water trenches or piping must be properly protected. Trenches should be lined with acid-proof brick, half tile, or plastics incorporating chemical hardening materials. Other floor areas that may be subjected to corrosive solutions should be similarly protected. Acid as well as alkali and cyanide rinse water will cause concrete to deteriorate. Plastic pipe or plastic-lined steel pipe is recommended for transferring rinse water where this type of system is to be used.

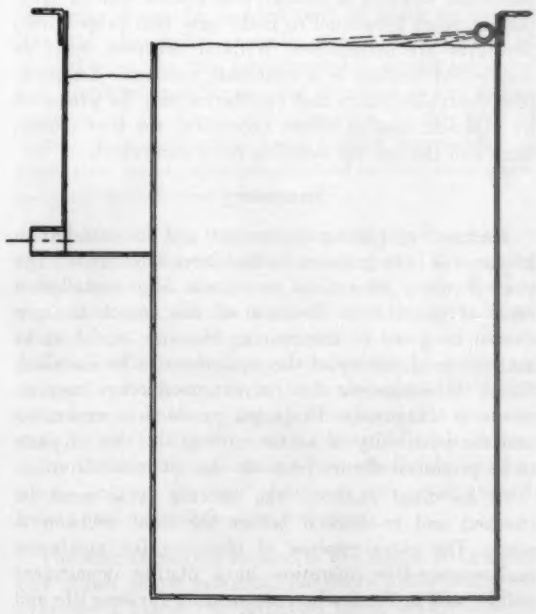


Figure 5

Figure 6

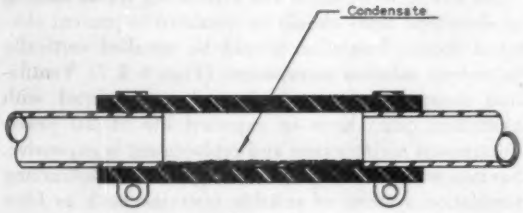


Figure 7

TANK CONSTRUCTION AND PROTECTION:

Plating tanks should be constructed and protected for long life. Since tanks usually corrode from the outside-in, especially those that are to be used for acid solutions, they should be lined with suitable material on the outside surfaces as well as inside. In cases where this expense becomes prohibitive, at least the walls between tanks should be well-protected. This includes the ends of rinse tanks following acid dips. Painting the outside walls of tanks presents a maintenance problem because paint is not very permanent. Processing tanks that are to be emptied occasionally should be provided with sumps (Figs. 3 & 4) extending approximately 2-3″ below the tank bottom to permit complete drainage of the solutions. Sludge and other foreign material can, with little difficulty, be flushed out with a water hose. The depth of tanks, especially the plating tanks, should have a clearance of at least 12″ from the bottom of the rack to the bottom of the tank. This permits any foreign material or sludge to remain undisturbed during operation especially when cathode rod agitation is used. Also, this dimension is necessary to provide sufficient space for pipes when air agitation of solutions is used.

The incorporation of overflow grease traps (Fig. 5) with a circulating pump or filter on cleaner, acid, copper strike, and plating tanks is recommended to prevent the accumulation of grease or oil films on the surface which cause difficulty, especially where copper and nickel is plated. Unit tank construction, that is, one long tank with partitions for several solutions at room

temperature, has an advantage of reduced cost and eliminates dripping of solution between tanks.

Tanks should be mounted on blocks or piers, 4-6" above the floor level, to permit a free flow of air under them, which will help maintain freedom from moisture.

VENTILATION:

All steam, water lines, and ventilation stacks leading to electrified tanks should be insulated to prevent electrical shorts. Insulation should be installed vertically to prevent solution entrapment. (Figs. 6 & 7) Ventilation systems constructed of steel and painted with asphaltum paint have an expected life of 2-3 years. Continuous maintenance and replacement is expensive. Savings will be effected in the long run by constructing ventilation systems of suitable materials such as fiber glass, rigid P. V. C. and plastisol-coated steel.

WASTE DISPOSAL AND WATER CONSERVATION:

Water supply and the chemical contamination of streams and rivers are very serious problems in many areas of the country. The plating industry is responsible for some of this pollution. Plating room waste disposal requirements vary from state to state. Local authorities in most cases will specify the maximum pollution permitted, but it is the responsibility of plating engineers to determine how it is to be accomplished and how it affects plating room engineering, such as:

a) Design of plating room trenching to segregate cyanide, acid, and alkali as required.
b) Provision for counterflow rinsing with air agitation to save water. Air agitation can be provided by low pressure blower, or syphon breakers which supply a mixture of air and water.
c) Control of water consumption by metering conductivity cell units.
d) Provision of drain station and/or fog rinsing of work to decrease "dragout."

HEATING OF SOLUTIONS AND CONTROL:

Two types of systems are used in heating plating solutions, i.e. external and internal. Steam or electricity are generally used as the heating medium. External heating by means of heat exchangers is generally used on large volume plating solutions. This system assures uniform solution temperatures. Since the solutions are continuously circulated through the heat exchangers by means of pumps, foreign material on the bottom of the tanks will be disturbed. Because of this, continuous filtration is necessary where roughness cannot be tolerated.

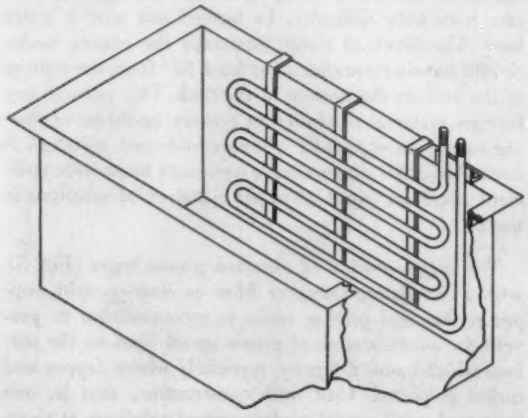


Figure 8

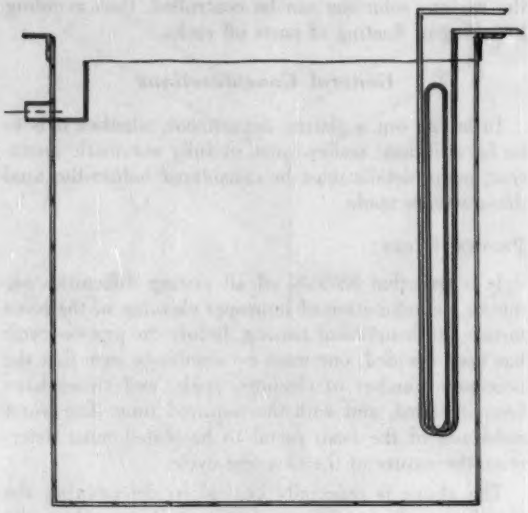


Figure 9

Internal heating has one advantage in that continuous filtration of heated plating solutions is usually unnecessary. Batch or intermittent filtration is used successfully by many platers. All internal heating units, no matter of which type, are placed along the walls of the tanks (Figs. 8 & 9). Units placed on the bottom of tanks become insulated due to sludge formation. Also, it is difficult to remove parts that may have fallen to the bottom.

The installation of temperature regulators for all heated tanks is strongly recommended. Indicating regulators are used where the operating temperature of a particular solution is critical. One cannot depend upon plating room personnel to make sure that proper temperatures are maintained. Without controls, over- or insufficient heating is a continual nuisance. Temperature controller bulbs and capillaries may be protected by a plastic coating where necessary; the type chosen must suit the specific solution to be controlled.

Summary

The cost of plating equipment and its installation has always been a major budget item in industry. The cost of major alterations or repairs after installation often is prohibitive. Because of this, much thought should be given to determining the size of the racks and the productivity of the equipment to be installed. Sizing of equipment for current production requirements is dangerous. Projected production expansion and the possibility of an increase in the size of parts to be produced should be taken into consideration.

In the final analysis, the process cycle must be checked and re-checked before the final decision is made. The extra expense of planning for maximum maintenance-free operation in a plating department will be well invested when engineering for long life and service is specified.

Improving Paint Adhesion on Phenolic Surfaces

ON certain occasions, the finisher is called upon to coat both metals and plastics in one operation. Especially when the plastics are hard and glossy, he often finds that unless some surface roughening is resorted to, paint film adhesion will be poor.

A new tough enamel based on epoxy resins is now being used to coat the phenolic interiors of Kodak Signet 40 Cameras manufactured by Eastman Kodak Company's Apparatus and Optical Division. The coating has enabled Kodak to speed up production and at the same time improve their finish coating.

The epoxy material, which in this case is being used to coat a phenolic molded part, produces a hard, chip-proof, scuff-resistant surface with a single spray application. It is available in simulated metallic finishes as well as in a spectrum of brilliant colors.

The development of a coating which adheres permanently to molded phenolic products represents a major breakthrough in a barrier that has long plagued the plastics industry. Previously, manufacturers who wanted color in their products could not use low-cost phenolic since it can be molded only in black or brown. Now the economical phenolic resins can be used, as molded items can then be enameled in almost any color and simulated metallic finishes at a cost as low as one cent per sq. ft. Along with phenolics — this type of coating formulation has been applied successfully to glass, zinc, wood, other plastics and metals (even stainless steel and chrome plate).

The material is a two component sytsem based on an Epon resin, and suitable hardening agents. The coating components and hardeners are mixed just prior to application and pot life of the mixture is approximately 36 hours. Cure of the enamel to the point where items may be handled can be obtained by either air drying for two hours or by force drying at 140°F. for 10 minutes; or by baking for one hour at a temperature of 250°F. The choice of curing schedule is generally dictated by production line scheduling requirements, but the ultimate properties will result regardless of the curing schedule employed.

The special coating applied to the Signet 40 is a dull type finish whose scanning incidence gloss is zero. It provides a black, non-reflective finish which absorbs virtually all stray light rays. Such rays, if reflected toward the film, could impair the quality of photographs taken with the camera.

According to Kodak engineers, the enamel has enabled them to improve certain manufacturing operations. Formerly, it was desirable to sandblast the interior of black phenolic camera parts to assure adhesion of the conventional air dry lacquer. Now, the epoxy enamel provides the required interior finish without the need for sandblasting.

The molded phenolic body represents the basic structure of the Kodak Signet 40 Camera. After the interiors have been sprayed with the enamel, the camera bodies are loaded onto metal trays. When full, the trays are inserted into a portable 20-tier rack. The rack is connected to a conveyor which carries the bodies through the force dry oven. Cure results in one hour at temperatures of 170°F. to 250°F.

Distortion of phenolic parts, which otherwise could result from oven curing of conventional finishes at temperatures in the range of the phenolic's distortion

(*Continued on page* 63)

(Courtesy of Eastman Kodak Co.)

Kodak Signet 40 Camera is shown with Kodak Rotary Flasholder. Both are products of the Apparatus and Optical Division of Eastman Kodak Company, Rochester, New York.

Reducing Spray Painting Costs

By J. Arthur Weed, *Consultant, Kirklyn, Penna.*

THE developments which have taken place in the paint application field in the past twenty years have been of enormous proportions. With them, management has been able to reduce operating costs while maintaining(and in some cases improving) coating quality. However, it is still a recognized fact that many millions of dollars are wasted each year in the paint finishing departments due to inefficiencies and improper planning.

With proper operator training, closer supervision, and the introduction of quality control methods, much of this waste will be eliminated. In practically all cases, attention to these items will save many times their costs.

Although management is usually well aware of material and labor costs for most plant operations, much too frequently paint finishing expenses are only very roughly known. Careful attention to this aspect of manufacturing, however, can frequently mean substantial savings.

A suggested plan for investigating the efficiency of an organic finishing shop follows:

First, since compressed air is usually the medium used for spraying paint, extreme care should be used in the selection of the air compressor. It should be of ample capacity to take care of current needs plus a carefully selected safety factor which will permit probably expansion needs. Next, the supply lines that are to carry this compressed air to the various points in the plant where it is to be used, should be of adequate size, so that a minimum of pressure loss is experienced. These supply lines should be so laid out that a large part of the moisture, sludge, etc. can be drained out before they reach the air transformer or filter that is used at the spray booth. In many plants, air transformers, which are located near the spray booths, are not adequately drained. There are many types of automatic air filters on the market today and, wherever it is possible, consideration should be given to incorporating them into the finishing system. Clean, dry, compressed air is a vital necessity for proper spray painting.

When selecting spray guns, it is important to know both the limitations as well as the potentialities of the various types. Consultation with the supplier and/or the equipment factory representative often repays itself many times over with fewer maintenance and downtime difficulties.

After the proper spray gun has been selected, the types of correct fluid tips and air caps have to be considered. Wherever possible, an internal nozzle or air cap should be used. In most cases, the use of an internal nozzle or air cap will permit the use of lower atomizing pressures, thereby producing less overspray. It must be stressed that with very abrasive, or fast drying materials, this type nozzle does not perform as satisfactorily as the external type air cap.

Where an external type fluid tip and air cap is to be used, it should be selected with utmost care, to provide the proper spray pattern and necessary speed of operation with a minimum of compressed air. Most manufacturers of spray painting equipment have charts that show the user what combination fluid tip, fluid needle and air cap to use for best results with various types of materials.

After the spray gun has been selected, the use of proper sizes of fluid and air hoses must be considered. The fluid hose should be small in diameter, with lining that will withstand the solvents which will be used with the material and for clean-up purposes. The air hose should be of as large a diameter as can be conveniently handled, to prevent pressure drop between the air regulator and spray gun. It is also wise to keep the length of both hoses as short as possible, in order to prevent excessive waste of cleaning materials and to keep hose replacement costs at a minimum.

The question of material supply is a very important one and should be given careful study before making a decision as to what to use. Gravity feed containers belong to the Dark Ages and should be relegated to the "scrap heap," as they are one of the greatest offenders in the waste of materials. Pressure tanks are widely used and do a much better job of material supply than the abovementioned units. If a pressure

(Courtesy Gray Co., Inc.)

A typical paint storage and circulating system.

tank is to be used, it would be wise to inquire about the state safety requirements as well as the insurance laws pertaining to their operation in your particular city or state. Many states have laws pertaining to unfired pressure vessels and, unfortunately, some of the equipment marketed will not meet these requirements.

If you decide to use a pressure container for your material supply, it is wise to select a unit that will have ample capacity to prove a full day's production. This will assure you of a uniform material mix and save considerable time and money in eliminating the down time required to add paint during the course of a working day.

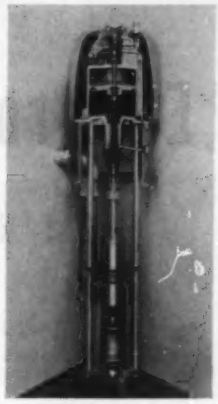
In the last ten to twelve years, paint pumps have been introduced to the industry which have accomplished a remarkable job. The first units were of the rotary gear type (air motor driven) and proved to have many drawbacks. Inasmuch as most paints are abrasive, the gears would wear rapidly and maintenance was very costly. The principle of pumping paint from the original container was very good and, since the introduction of this type of unit, many improvements have been made.

Also in the early days of paint pumping, pumps that were designed for handling lubricants were used. These were of the air operated, positive displacement type. Their major drawback was the type of seals which were used to prevent the material being pumped from getting into the air motor part of the unit. With the abrasive action of paints, these seals would fail, and again costly repairs and loss of production time resulted.

However, with the background of experience that the manufacturers of this equipment acquired, most of them have developed a very satisfactory type of air operated reciprocating type of pump. The air motor and the pumping assembly are separated from each other and there is little possibility of material getting past a seal assembly, since there are no seals between the two units. They are connected by means of a rod between the air motor and pump while the paint is pumped through what is called an outboard riser tube. Pumps of this type are called divorced motor pumps and are doing an outstanding job in the handling of most of the materials used in spray painting.

Of course, the ideal setup for large users of paint would be a centrally located, fire-proof, paint storage room, where the paint could be pumped to the various spray booths throughout the plant. Adequate ventilation of this room would be necessary, and it would be wise to check with your fire insurance underwriter to determine how many air changes they would prefer you to have.

"Good Housekeeping" does not cost money; it saves many times the equipment cost that is initially required. This is usually the best place to start a clean-up program. Many of the manufacturers of the equipment used in the centrallized, paint circulating systems offer a planning and lay-out service that costs the prospective customer little or nothing. By taking advantage of their experience, many costly errors in planning are often avoided. An added dividend in the form of a compliment from the fire insurance underwriters and, in many cases, insurance costs themselves may be



A cut-away view of a positive displacement pump.
(Courtesy Gray Co., Inc.)

lowered, due to the cleaning up of paint storage and spraying areas.

The importance of viscosity control cannot be stressed too strongly. "Hit or Miss" methods of paint mixing are often unnecessarily expensive. The viscosity of material being sprayed determines whether too much or too little paint is being deposited. Something as important as this should not be left to the judgment of the operator, since there are many good, inexpensive, viscosity testing methods available. The cost conscious executive should see that some method of testing is continuously practiced.

Thorough agitation of paint is another must and, here again, "halfway" measures should not be employed. Mechanical agitators are available which will save many times their cost in better paint mileage, plus a much better, more uniform finish.

Paint savings may be realized through closer inspection and the introduction of quality control methods. Again, equipment for the determination of dry film thickness is available and comparatively inexpensive. It is impossible for a human being to determine whether or not a product has too much or too little paint. Rule out the possibility of error and use the right equipment for the job.

In most of the skilled trades, such as carpentry, tool and die making, machining, bricklaying, etc., a man must serve an apprenticeship, and only after four years of training is he considered a skilled artisan. In paint spraying, a man will be hired, given a few hours at most of training, and be expected to become an expert in a very short time. Unfortunately, insufficient time has been spent to train these men to show them how to best do their job.

Some of the manufacturers of paint spraying equipment conduct schools or clinics, where plant personnel can be properly trained in the use of spraying equipment. This is a service that plant management should certainly take advantage of, since the small cost of sending, at least his key personnel to attend these schools, will be returned a hundred-fold in increased efficiency. Those who attend these schools or clinics could then properly instruct others in proper spray painting techniques.

If more thought and planning were given to the finishing of products in many of the manufacturing plants in this country, very substantial savings would result. To sum up the requirements of an efficient,

(*Continued on page* 63)

Electropolishing

What, How and Why

By John F. Jumer
Electro-Glo Co., Chicago, Ill.

This is the second and final installment of the article by Mr. Jumer. Part I appeared in the August issue.—*Ed.*

Typical Solutions

Complete examination of the innumerable types of electropolishing solutions, for all varieties of metals and alloys, would be impractical. The intent here is to deal with only those solutions (mostly patented and listed below) which are either academic or of current interest.

Basically, electropolishing is accomplished in:

1. Alkaline solutions, on such metals as aluminum, tungsten and zinc.
2. Cyanide solutions, mainly for metals such as gold, silver, zinc and cadmium.
3. Acid solutions, most popular for aluminum, copper, nickel, carbon steel, and stainless steels.

The acid types are further divided into those which are concentrated (with less than 50% water) or the high water content types (with over 50% water). The concentrated acid type solutions constitute over 90% of the commercial electropolishing being done today, since not only brightness is accomplished, but smoothing and leveling as well.

Two basic differences in electropolishing solutions, determined by composition, are those with:

1. *Infinite Life.* This is possible because the metal salts, formed as a product of electropolishing, form a sludge which does not interfere with the operation.
2. *Finite Life.* Optimum results cannot be obtained with metallic salts (more than several per cent) dissolved in the solution. These baths are non-sludging. This type requires periodic decanting and replacement with new solution, keeping the metallic salt concentration within limits.

A definite water content is present in all of the following bath compositions. It has been purposely omitted to eliminate possible error, since the variables in constituent concentrations and preferred ranges are unknown.

Aluminum

Being amphoteric in nature, aluminum can be electropolished in both acid and alkaline electrolytes. The brightening process involves low rate of attack, use of high purity aluminum, and requires pre-finishing.

BRYTAL PROCESS:

First Stage (Brightening)

Sodium carbonate	15%
Trisodium phosphate	5%
Temperature	165-190°F.
Amp./ft.,^{2} Initially	50-60

Second Stage (Anodizing)

Sodium bisulfate	25%
Voltage	12
Time	20-30 Min.
Amp./ft.^{2}	6-8
Hot water seal	15 Min.

ALZAC PROCESS:

First Stage (Brightening)

Fluoboric acid	2.5%
Temperature	85°F.
Voltage	15-30
Amp./ft.^{2}	10-20

The polarized film is stripped in hot alkaline solution. Anodizing, as usual, in the sulfuric and bath follows.

Polishing and brightening are obtained in concentrated acid-type solutions, which feature greater stock removal and greater smoothing.

MASON & TOSTERUD

Sulphuric acid	1-60%
Hydrofluoric acid	0.2-1.5%
Amp./ft.^{2}	100
Temperature	140°F.

JACQUET

Perchloric acid	34.5%
Acetic anhydride	64.5%
Amp./ft.^{2}	10
Temperature	68°F.
Voltage	26

ALCOA

Phosphoric acid	35-45%
Glycerol	30-40%
Water	20-30%
Amp./ft.^{2}	35-40
Temperature	150-180°F.
Voltage	35

Sulfuric acid is an optional addition.

BATTELLE

Sulfuric acid	4.7%
Phosphoric acid	75%
Chromic acid	6.5%
Al^{+++} & Cr^{+++}	to 6%
Amp./ft.^{2}	150
Temperature	175-180°F.
Voltage	10-15

Chromic acid decreases the etching rate, but changes from hexavalent to trivalent form in use. Sulfuric acid drops the cell resistance or voltage, but increases the etching rate.

HERENGUEL

Phosphoric acid	10%
Sulfuric acid	60%
Nitric acid	1%
Amp./ft.^{2}	200
Temperature	205°F.

Nitric acid has the same effect as chromic acid in the previous formula.

BRITISH

Phosphoric acid	40-90%
Boric acid	1-5% to Sat.
Oxalic acid	3% to Sat.
Heavy metal salt	0.5 to 2 g./l.

Copper and Alloys

METALLOGRAPHIC

MATERIEL TELEPHONIQUE (1931)

Pyrophosphoric acid	35% Sol'n
Amp./ft.^{2}	74-93
Voltage	1.6-2
Temperature	60-71°F.
Time	10-15 Min.

LOWERY WILKENSON & SNARE (1936)

Orthophosphoric acid	Sp.G. 1.3-1.5
Amp./ft.^{2}	6.5
Voltage	2
Temperature	Room

WILLIAMS & RIEGER (1940)

Ammonium acetate	10 ml.
Ammonium hydroxide	30 "
Sodium thiosulphate	30 "
Distilled water	30 "
Amp./ft.^{2}	2
Time	10 Sec.

COMMERCIAL

C. FAUST (1942)

Arsenic acid	15%/wt.
Phosporic acid	55 "
Chromic acid	3 "
Water	27 "
Temperature	130°F.
Amp./ft.^{2}	500

R. W. MANUEL (1943)

Water	100 parts/wt.
Chromic acid	12.5 "
Sodium dichromate	37.5 "
Acetic acid	12.5 "
Sulfuric acid	10.0 "
Amp./ft.^{2}	250-1000
Temperature	86°F.

C. FAUST (1944)

Sulfuric acid	14%/wt.
Phosphoric acid	59 "
Chromic acid	0.5 "
Water	36.5 "
Temperature	60-170°F.
Amp./ft.^{2}	100-1000

F. C. MATHERS & R. E. RICKS (1944)

Phosphoric acid in cyclohexanol	40%/Vol.
Temperature	212°F.
Amp./ft.^{2}	200
Time	5 Min.

H. J. WIESNER (1951)

Sodium tripolyphosphate	14-16 oz./gal.
Boric acid	4-5 "
pH	7-7.5
Temperature	125-135°F.
Amp./ft.^{2}	100 minimum

S. B. EMERY (1952)

Ammonium phosphate	100 parts
Citric acid	100 "
Potassium phosphate	25 "
Water	1000 "
Voltage	6-25
Amp./ft.^{2} (alternating current)	75-575

Nickel and Alloys

An interesting progression of some solutions can be noted in the following patents:

1938

Sulfuric acid	70%
Water	30%

German Pat. 645,979

1939

A. Sulfuric acid	60% minimum
Chromic	To saturation
Water	As required
B. Sulfuric acid	60% minimum
Glycerine	200 ml./l.
Water	As required
C. Nickel sulphate	240 g./l.
Ammonium sulphate	45 "
Potassium chloride	35 "

British Pat. 504,026

1940

Orthophosphoric acid	15-70%
Sulfuric acid	15-60%
Water	Balance

British Pat. 526,966

1944

Sulfuric acid	14%
Phosphoric acid	59%
Chromic acid	0.5%
Water	36.5%

U. S. Pat. 2,334,699

Carbon Steel

Steel is more difficult to electropolish to the same degree of perfection as other metals, due to variations. It has good potential in industrial applications, as well as for brightening and smoothing. However, results are not consistent due to great variations in composition and surface condition from mills and/or heat treatment.

P. JACQUET & P. ROCQUET

Perchloric acid	18.5%
Acetic anhydride	76.5%
Distilled water	5%
Amp./ft.^{2}	43-115
Temperature	68°F.
Voltage	50

This solution was developed for metallographic applications.

H. UHLIG

Phosphoric acid	50%
Amp./ft.^{2}	75-150
Temperature	150°F.

This bath has been found unsuitable for commercial use.

BERGMAN, ERIKSON, FREY & HILDEBRAND

Hydrochloric or hydrofluoric acid	50%
Water	50%
Gelatin	0.2 g./l.
Amp./ft.^{2}	1400 minimum
Temperature	50-105°F.

Extremely high current densities are required and superimposed a.c. is recommended.

R. DELAPLACE & C. BECHARD

Pyrophosphoric acid	400 g.
Ethyl alcohol	To make 1 L.
Temperature	20°C.
Amp./ft.^{2}	300

Cooling of the electrolyte is required, and water must be absent.

C. FAUST

1.

Sulfuric acid	40%
Phosphoric acid	49.5%
Amp./ft.^{2}	500
Temperature	100-190°F.

High current densities are required.

2.

Sulfuric acid	15%
Phosphoric acid	63%
Chromic acid	10%
Amp./ft.^{2}	50-1000
Temperature	125°F.

This solution has a finite life.

R. EDMONSON

Hydrochloric acid	25%
Glycerine	75%
Amp./ft.^{2}	15
Temperature	Room
Method of rejuvenation	Acetone

This formula is good for electromachining. Stock removal is 0.001 inch/hr.

WEISBERG & LEVIN

Lactic acid	33%
Phosphoric acid	40%
Sulfuric acid	13.5%
Amp./ft.^{2}	100
Temperature	65-90°F.

Polishing rate is quite low, 1-2 hours being required.

HAMMOND, EDGEWORTH & BOWMAN

Phosphoric acid	55-85%
Tri-alkali metal phosphate	1-15%
Alkali metal sulphate	0.5% min.

C. J. WERNLUND

Hydrogen fluoride	400 g.
Water	450 "
Triethanolamine	1490 "
Amp./ft.^{2}	20-200
Temperature	175°F.

Salts plate out on cathode in this bath.

Stainless Steel

Stainless steel is the most popular electropolished metal today. It is difficult to polish mechanically. It retains its finish, no after treatment being required.

C. P. MADSEN

Phosphoric acid	75-100%
Water	0-25%
Amp./ft.^{2}	300
Temperature	150°F.

H. UHLIG

Phosphoric acid & Glycerine	90%
Glycerine	Over 50%
Amp./ft.^{2}	Over 20
Temperature	Over 200°F.

C. BECKWITH

Phosphoric acid	5 Parts
Sulfuric acid	4 Parts
Glycerine	1 Part
Amp./ft.^{2}	450
Voltage	9

J. OSTROFSKY

Citric acid	55%
Sulfuric acid	15%
Amp./ft.^{2}	100 minimum
Temperature	200°F.

This solution freezes below 130°F. Alcohol is recommended to reduce the freezing point.

C. FAUST

Sulfuric acid	15%
Phosphoric acid	63%
Amp./ft.^{2}	50 minimum
Temperature	80-175°F.

I. CLINGAN

Phosphoric acid	56%
Sulfuric acid	27%
Diethylene glycol mono-butyl ether	7%
Temperature	125-165°F.

WEISBERG & LEVIN

Lactic acid	33%
Phosphoric acid	40%
Sulfuric acid	13.5%
Amp./ft.^{2}	75-300
Temperature	160-200°F.

C. FAUST

Phosphoric acid	56%
Chromic acid	12%
Amp./ft.^{2}	100-1000
Temperature	80-175°F.

H. WHITE

Phosphoric acid	90%
Normal butyl alcohol or equiv.	10%
Amp./ft.^{2}	75-750
Temperature	180°F.

A. FIELD

Nitric acid	70%
Acetic acid	30%
Amp./ft.^{2}	75 minimum
Temperature	75°F. max.

This process uses alternating current. Electropolishing occurs on the positive half cycle.

J. KREML

Sulfuric acid	10-60%
Glycolic acid	20-80%
Amp./ft.^{2}	150 minimum
Temperature	175-212°F.

W. J. NEILL

Sulfuric acid	48%
Fluoboric acid	14%
Oxalic acid	1%
Amp./ft.^{2}	50-250
Temperature	140-168°F.

The Future

While improvements are constantly being made in methods and solutions, a great deal rests with those who have not as yet made themselves aware of the possibilities of this modern method of metal finishing. Better understanding is needed by those offering and those considering electropolishing — as to its limitations, as well as its possibilities. While it is an important and versatile tool in the metal finishing field it cannot be considered a "cure all."

Today earlier problems associated with electropolishing have been overcome, such as:

Expensive bath constituents.
Explosive and toxic hazards.
Impractical voltages and current densities.
Narrow operating ranges.
Inconsistent performance.
Unstable bath constituents.
Poor throwing power.
Finite life solutions.

Tomorrow we can expect:

Barrel electropolishing for all metals.
Throwing power equal to nickel.
True polishing without pitting and etching.
Full sludging solutions with infinite life.
Quality control by the mills of variables affecting finishing.
Simple and reliable control and analysis.
Electropolishing of zinc die castings and aluminum silicon alloys.

IMPROVING PAINT ADHESION

(*Continued from page* 57)

point, is avoided by the air dry and low baking temperatures permitted by the new epoxy finishing material.

(Courtesy Eastman Kodak Co.)

The interior of molded body of the camera is sprayed with the epoxy finish to eliminate reflectivity. Rack of already sprayed parts is shown at right.

In some applications, epoxy enamels eliminate multistep coating procedures. For example, because of its excellent adhesion to even the highest gloss phenolics, a single coating of an epoxy enamel may replace the two-step operation of primer and lacquer. Also, the steps in wrinkle finishing may be reduced. The steps for one particular product formerly included: priming, baking, wrinkle finishing, baking, top coating, and baking. Now it is possible to use the same epoxy coating as a primer under the wrinkle and as a top coat over the wrinkle. Since the epoxy coatings may be air-dried, this can eliminate two of the three baking operations.

REDUCING SPRAY PAINTING COSTS

(*Continued from page* 59)

economical, spray painting system, the following points should be considered:

1. Obtain an adequate supply of clean, dry, compressed air.
2. Select the proper spray gun for the service involved.
3. Make sure of proper size and length.
4. Plan a material supply system that will permit "Good Housekeeping" methods.
5. Institute a system of viscosity control and place the responsibility for its operation in the hands of your most competent personnel.
6. Set up quality control standards.
7. Arrange training for key personnel.

When the above suggestions are followed, it is probably that many finishers will substantially reduce their organic finishing costs.

Science for the Coatings Technologist

Part XI. Paint Additives: Driers and Anti-Skinning Agents

By E. S. Beck

THE group of additives we are going to consider in this discussion have one thing in common: they work only on oxidizing materials. Driers speed up the rate of oxidation, while anti-skinning agents slow the rate down. It seems, at first thought, as though a formulation might call for either a drier or an anti-skinning agent, but not both. Yet, almost all air-drying formulations based on oils, varnishes, alkyd resins and other oil-derived vehicles contain agents designed both to accelerate the uptake of oxygen, and also to delay it.

The explanation lies in the timing. Anti-skinning agents are designed to be effective principally in the packaged paint. They are generally rather volatile, and leave the applied film early enough to avoid excessive inhibition of the drying. Within the closed package, they are expected to be sufficiently permanent to inhibit surface oxidation, hence skinning. Driers, on the other hand, are solid, non-volatile materials which are permanent parts of the film, and do not usually begin to operate until the film has been applied and is exposed to the air.

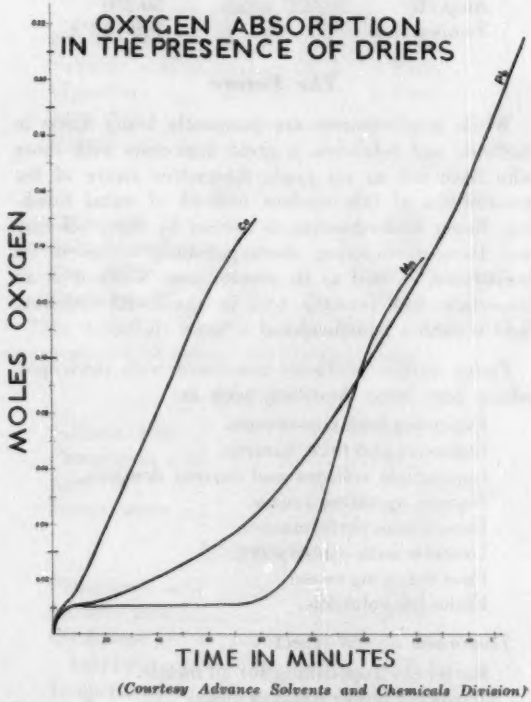
These are the ideal conditions, however. As will be shown in the detailed discussions, some anti-skinning agents are non-volatile or very slow-evaporating. These can interfere with the drying of the film very markedly, and often do. When these materials are used, extreme care is necessary to balance off the driers with the anti-skinning agent so that each type can do its work with minimum interference from the other.

There are even some circumstances where driers and anti-skinning agents can react with each other directly. If cobalt naphthenate drier is mixed with antiskinning agent of certain types, the purple color of the cobalt is destroyed as it is reduced, showing very plainly to the eye that an inter-reaction is taking place.

This phenomenon is fairly well-known to technicians in the paint industry. The standard practice in adding driers and anti-skinning agents to a batch is to add each separately, with thorough mixing before adding the other. The theory behind this is that each material will be well-diluted by the volume of the batch as a whole, hence less able to react directly with the other. One would think that they would manage to find each other nonetheless in standard chemical fashion. But it must be admitted there is little falling-off (at least in a short time) in the activities of either the drier or the anti-skinning agent when they are added to the batch in this manner.

Both driers and anti-skinning agents are used in very small quantities in batches of paint. While the amounts are small, it is essential that they be accurately measured. Where very small amounts are involved, dilutions are frequently used. Dilutions make it easier to measure out small quantities, but the drawback of unstability is encountered with many drier dilutions. In general, only enough of a dilution should be prepared to last for one week. As soon as any precipitation or change in color is observed, the dilution should be discarded.

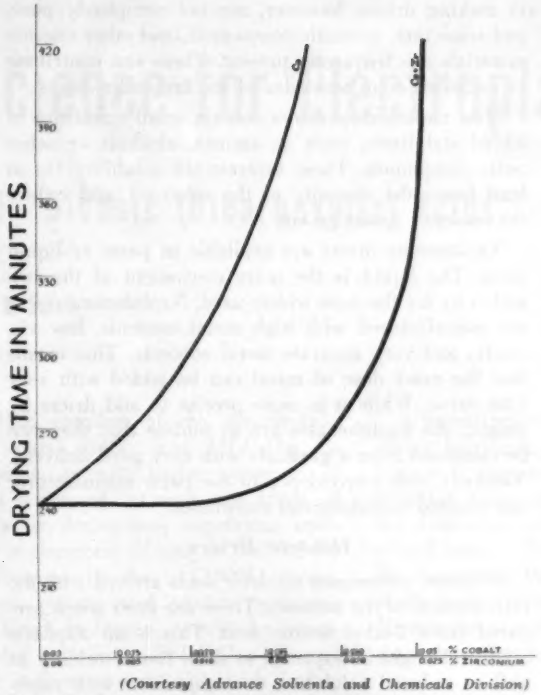
In days gone by, when formulations were simpler, composition and amounts of drier and anti-skinning agent were the subject of much more study than today. Formulations would be checked with a variety of different drier and anti-skin adds. After both drying and skinning tests, the best combination would be chosen. It was not uncommon for more time to be spent on the adjustment of these two ingredients than on the balance of the formula. (I am referring to formula-



(Courtesy Advance Solvents and Chemicals Division)

Figure 1. Oxygen Uptake of ASTM Raw Linseed Oil Containing Driers.

It can be seen that the oxygen absorption is greatly modified by the individual driers. In the case of cobalt, there is an almost immediate start to the absorption of oxygen. In the case of manganese, there is an 80-minute period before the absorption begins. This period is known as the induction period. It is attributed to the presence of natural anti-oxidants in the oil. One of the functions of driers is to reduce this induction period.



(Courtesy Advance Solvents and Chemicals Division)

Figure 2. Replacement of Cobalt by Zirconium in ASTM Linseed Oil.

This chart illustrates the changes in drying time when the drying metal composition is changed. In this particular case, the total metal, calculated on oil, is kept constant at 0.03%. It is varied from 0.03% cobalt to 0.05% cobalt. In the first curve, no zirconium is added; while in the second, the metal content is brought back to 0.03% with zirconium. When the cobalt level is reduced to one-half (0.015%) the oil requires 7 hours to dry. If zirconium is present in an equal amount, the drying time remains at 4 hours, even with the reduced cobalt. This illustrates the activating tendency of zirconium on cobalt.

tions which were relatively standard in general properties.)

Today, these adds are much more routine. Optimum values have been established for all classes of vehicles, and these are generally used without further testing. The tremendously widened choice of vehicles available today makes it possible to achieve changes in drying characteristics by adjusting the vehicle itself. Alterations achieved in this way are much more positive and dependable than those formerly obtained by drier changes.

This does not mean that the use of driers and anti-skinning agents is any less important. Oil-bearing vehicles still will not dry well without driers; and they still will skin in closed containers if no anti-skinning agent is present. But they no longer get or require the meticulous care and adjustment they once received.

Driers

Driers are catalysts for the oxidation of oils containing double bonds. They also serve as polymerization catalysts. The most commonly used catalysts are the soaps of the metals lead, cobalt and manganese. Other metallic soaps used to a lesser extent, or for special purposes (in connection with drying) are calcium, zirconium, iron, cerium and zinc. All the drying materials in use are metal compounds, largely soaps or materials which become converted to soaps in the vehicle.

There is a single exception to that statement. The material 1-, 10-phenanthroline, while not a drier in itself, greatly increases both the drying power and the stability of metallic driers in service. This material will be considered in more detail later.

The mechanism of drying of oils is a complicated and only partially-understood process. Both polymerization and oxidation occur. Both processes center at the double bond in the structure of the drying oil. The oxidation is thought to occur by means of peroxide formation at the double bond, the source of the oxygen being the air. Driers accelerate this process, probably through changes in valence.

That valence plays an important part is indicated by the fact that the active drying metal (lead, cobalt, manganese and iron) all are capable of existing in at least two valence states. They probably aid greatly in the transmission of oxygen into the film by absorbing oxygen then releasing it by dropping to a lower valence state.

At any rate, the drying of a material such as linseed oil is reduced from four days to a single day by the use of driers. It has been demonstrated that the rate of oxygen pick-up by the film is definitely increased. However, the total increase in oxygen is less in a film containing driers than it is in a drier-free film.

This effect is attributed to the polymerizing influence of the drier. Polymerization is a reaction competing with oxidation during the drying of the oil film. For most purposes, a greater degree of polymerization and less oxidation is desirable. Polymerization produces carbon-to-carbon linkages which are extremely stable. Oxidation produces oxygenated compounds, such as acids, esters and alcohols, all of a lower degree of stability.

In addition to stability, polymerized films are generally more resistant, flexible and tough than oxidized ones. So this property of driers in promoting polymerization is a valuable one. The mechanism, again, is not well understood. But lead is one of the best polymerization catalysts, not only for the drying of oils, but also in the production of alkyd resins, which are highly polymerized.

Driers were originally used in the form of salts, such as acetates. These were generally cooked into the varnish itself during its manufacture. This process, besides producing much discoloration in the vehicle, was rather inaccurate. It is true that a specific amount of lead acetate (for instance) might be weighed into the batch. But that did not mean that a specific amount of lead remained in the finished varnish.

That part which reacted to form a permanently soluble soap remained in solution. That part which converted to oxide, stearate, oleate, or other insoluble form precipitated to the bottom as a sludge, and had to be removed by filtration. In fact, even after a filtration, insoluble drying metal soaps would continue to separate out and form a cloud or even precipitate. (This problem, at times, is still with us, it must be confessed.)

As a result of the variable metal content achieved by the cooking-in process, the dry of varnishes prepared in this manner was often unpredictable. As a result,

more soluble and dependable drier bases were prepared. These were the fused driers, which still find a limited use today. Actually, the cooking-in of metal salts or oxides produced a type of fused drier, which was dispersed throughout the varnish as it was formed. Better control was obtained by cooking together the metal compound and oil acids to form a relatively pure soap, fairly high in metal content. This soap, dry or in solution, was then added to the varnish. It was still generally cooked-in with heat. If a good quantity of rosin were present in the drier soap, improved dispersibility and stability was obtained.

Thus, eventually, resinates or lino-resinates came to dominate the fused drier field. These materials are still offered for sale, and still used to a limited extent today in paints. They can be dispersed, using heat, in vehicles, to give reasonably satisfactory results.

However, fused materials are still somewhat variable in composition, because of the method of manufacture. They do not work well unless dispersed in solvents or vehicles which are heated. So further improvements were quite desirable. These culminated in the precipitated type of drier, which is the group most widely used today.

Essentially, the precipitated drier is produced by reacting a solution of the metal in the form of a soluble salt with the desired acid, also in solution in the form of a soluble salt. When the two solutions are mixed, the drier precipitates out of solution as the insoluble metal salt of the desired drier acid. In this way, quite pure compounds can be prepared. These will be uniform in metal content, hence more dependable in drying activity.

The particular acid selected depends on a number of factors, including price and properties desired. The acids most generally used are naphthenic, 2-ethyl octoic, abietic, and the isolated fatty acids of tall oil. There are a few other materials which are infrequently used, and do not require our attention.

The precipitated driers made with abietic acid (the acid of rosin) are the equivalent, in precipitated form, of the fused resinate driers. They are of a higher degree of purity, but still must be cooked in, or at least incorporated while the vehicle is hot. This can become undesirable, under some circumstances. This type of drier, while still offered by manufacturers, finds only limited usage.

Naphthenate Driers

These are probably the most popular and most widely-used of today's driers. The naphthenate soaps of the drier metals are quite stable, far more so than the resinates or soaps of the drying oils formerly used. This is because the naphthenates resist oxidation, remaining in their original state. Soaps of drying acids tend to convert to insoluble materials in time.

The naphthenates of the drying metals, such as lead, cobalt, etc., are soluble, dispersable, and stable in solution. This is because the ring structure of the naphthenic acid contributes greatly to the stability of the molecule, while at the same time conferring good solubility characteristics.

Naphthenic acid is a chemical of commerce, and is essentially hexahydrobenzoic acid. The materials used in making driers, however, are not completely pure, and some tars, aromatic compounds, and other organic materials are frequently present. These can contribute to increased color and odor of the finished material.

Most naphthenate driers contain small quantities of added stabilizers, such as amines, alcohols or other polar compounds. These increase the solubility (or at least lower the viscosity of the solution) and reduce the tendency to sludge out.

Naphthenate driers are available in paste or liquid form. The liquid is the more convenient of the two and is by far the most widely used. Naphthenate driers are manufactured with high metal contents, low viscosity, and very accurate metal contents. This means that the exact dose of metal can be added with very little error. While it is more precise to add driers by weight, the naphthenates are so mobile that they can be measured from a graduate with very good delivery. Naturally, this convenience to the paint manufacturer has resulted in widespread acceptance.

Octoate Driers

A further refinement on drier acids arrived with the introduction of the octoates. These are drier soaps prepared from 2-ethyl hexoic acid. This is an aliphatic acid, and might be expected to show lower stability as well as reduced solubility, in comparison with naphthenic acid. But the performance of octoate driers has actually shown the opposite.

The octoates show distinctly improved stability and solubility over the naphthenate driers in practically all vehicles. This improved stability is quite a valuable property, and in all critical cases octoate driers should be used. Especially in clear materials, the increased freedom from hazing or sludging is very desirable.

Octoates are somewhat more expensive than naphthenates, but many manufacturers are finding them worth the difference. These materials were first developed in the late thirties, but did not come on the market in volume until after the war. They have achieved wide and rapid acceptance considering how new they are in actual fact.

Another advantage of the octoates lies in their odor characteristics. They are almost entirely free of odor. This makes them quite useful in today's odorless paints. Naphthenates, and most other types of drier as well, have a definite odor. This is quite plainly detected when a large inside area such as a wall or door is painted.

Octoates are lighter and more permanent in color than other types of driers. The base acid is extremely light, practically water-white, unlike naphthenic acid. The calcium and zinc octoates are practically colorless. The cobalt and manganese octoates stain less in white finishes than do the corresponding naphthenates. The staining of cobalt or manganese is sometimes objectionable (especially manganese) as a brownish discoloration of surprising hiding power is produced by the oxidation of the drier. The octoate driers are much better in this respect than the naphthenates.

Tallate Driers

Tallates are prepared using the fatty acids of tall oil

(*Continued on page* 79)

Science for Electroplaters

40. Dibasic (Dicarboxylic) Acids

By L. Serota

THE simplest of the dicarboxylic acids, oxalic acid ($H_2C_2O_4$), is capable, as with higher members of this series, of forming two kinds of salts or derivatives, depending upon the replacement of one or both of the hydrogens in the —COOH groups. Thus, sodium acid oxalate, with one replaced hydrogen, would be represented as follows: $NaHC_2O_4$; whereas, the sodium oxalate with both hydrogens replaced would be ($Na_2C_2O_4$). Oxalic acid may be formed by the oxidation of ethylene glycol $CH_2OH{\cdot}CH_2OH + 4[O] \rightarrow (COOH)_2 + 2H_2O$.

C. J. Fink and *C. Y. Wong* discussed results obtained with a copper sulfate-oxalate bath as a substitute for the copper cyanide strike bath. A satisfactory copper deposit was reported in 60 seconds at a current density of 10 amp./ft.^{2}, which represents a shorter time than that required for the cyanide bath. The complex copper oxalate salt produces the low concentration of copper ions. The deposit obtained from this bath is suitable as a base for the acid copper bath. The following facts relating to this bath are cited: Cost is less than that of a cyanide solution; throwing power compares with the sulfate bath; anode corrosion is easily controlled. This latter condition (control) holds also for the bath composition. The bath composition is:

$CuSO_4{\cdot}5H_2O$	2.1 oz./gal.
$Na_2C_2O_4$	2.3 "
Na_2SO_4	0.8 "
H_3BO_3	2.7 "

Sodium sulfate was added to improve the conductivity of the solution and boric acid to regulate the pH (buffer). The equation for complexation is as follows: $2Na_2C_2O_4 + CuSO_4 \rightarrow Na\,[Cu(C_2O_4)_2(H_2O)_2] + Na_2SO_4$. The solubility of the copper salt at room temperature is 2.68 oz./gal.

A patent granted in 1955 for a polishing lubricant, which prevents loading and increases the cutting and grinding action of such surfaces, lists the following composition on a 100 pound basis: tallow 65 lbs., paraffin 29 lbs., beeswax 6 lbs., citric acid 1.3 lbs., oxalic acid 1.3 lbs., urea 6.6 lbs. and Vienna red in sufficient amount to produce the color desired.

Oxalic Acid Anodizing

One of the principal industrial aluminum anodizing processes employs an oxalic acid solution. The acid concentrations for this type bath range from 3 to 5 per cent for baths used in Japan and Germany to slightly higher acid contents of 5 to 10 per cent for baths operated in Britain and America. The other common anodizing baths are based chiefly on the use of either sulfuric, chromic or, to a lesser extent, sulfamic acid.

When current flows through an electrolyte wherein the anode is aluminum, the anion, which is negatively charged, will migrate towards the anode, where it is discharged with the loss of one or more electrons (oxidation). In an aqueous solution, during such process of anodic oxidation (electrolysis), the anion, which consists in part of oxygen, will unite chemically with the aluminum, (anode) forming an oxide film. The nature of the film will depend upon the electrolyte, current, potential, bath temperature, and time of treatment. A general classification of the main purposes of anodizing includes: (a) protection against corrosion and abrasion; (b) decorative-protection for polished metallic surfaces; (c) base for paint and other organic finishes; (d) base for electrodeposits.

The oxalic anodizing process is especially adaptable, according to *S. Wernick* and *R. Pinner*, to specific protective or decorative applications, such as the production of hard or thick coatings (up to 60 μ or 2.4 mils), with the increase of film thickness being almost linear during the first hours of treatment. The color of the film will vary from almost colorless to yellowish with variations in voltage, temperature, and treatment time. A modified process, in which a thallium, zirconium, or titanium salt is included in the solution, produces a film of non-metallic appearance resembling porcelain or enamel. The operating data for one formula includes:

Titanium-potassium oxalate	40 g./l.
Boric acid	8 g./l.
Citric acid	1 g./l.
Oxalic acid	1.2 g./l.
Temperature	55°C.
C.D.	3 amps./dm.^{2}

For most decorative applications, the oxalic process is generally inferior to the sulfuric acid bath, because of the rigid operating requirements relating to shade and thickness of the coating in a prescribed treatment time. Then too, oxalic acid coatings do not dye as well as those produced in a sulfuric acid bath.

Historical

The oxalic acid method of anodizing aluminum was developed, according to *S. Tajima*, in 1923 in Japan by Kijira, Ueki, Setoh and Miyata and is still largely used. Two patents were granted for anodizing aluminum and its alloys (in Japan) in 1924 for an oxalic bath, employing d.c. or a.c. A small pilot plant installation in 1928, at the Institute of Physical and Chemical Research, led to the observation that steam sealing produced a dense, corrosion-resistant film. If, after rinsing, the anodized object is placed in an autoclave for 20-30 minutes at 50-70 p.s.i., with dry steam, the film became yellowish and increased in transparency.

The commercial anodizing process in Japan is carried on in lead lined tanks, with water cooling in the tank. The electrolyte is a 3 per cent oxalic acid solution, which may vary from 1 to 5 per cent. Graphite or lead cathodes are used. The process generally entails superimposing a.c. (60-100 volts) on d.c. with a voltage of 25-30, and a current density of 10-20 amp./ft.^{2} The resulting color of the anodic film, after

steam sealing for 30 to 60 minutes, is golden yellow.

The suggestion, advanced in a paper presented at a World Engineering Congress in Tokyo in 1929, that the steam sealing process could not be patented in foreign countries, led to the development of the Eloxal process in Germany. Wernick and Pinner refer to four standard processes, using solutions containing 3 to 5 per cent oxalic acid, which operate under the following headings: (1) Eloxal GX is the basic d.c. process with current densities of 10 to 20 amp./ft.^{2}, applied at 40 to 60 volts with bath temperature maintained at 18° to 20°C. Treatment time is 40 to 60 minutes. Coatings by this method have good wear resistance and are yellow on aluminum and alloys that do not contain heavy metals; (2) Eloxal GXh is a modification of the first process, whereby the temperature of the bath is increased to 35°C. with the voltage dropping to 35 to 40 volts, while the treatment time is reduced to 20 to 30 minutes because the limiting thickness is reached sooner. The oxide coating by this method is somewhat softer and thinner with increased porosity, a condition favorable to dyeing and photographic processes; (3) Eloxal WX is the a.c. process operated at 20 to 30 amp./ft.^{2} at 20 to 60 volts. Bath temperature is 25 to 35°C. and treatment time is 40 to 60 minutes. This process provides a softer coating and is used in anodizing wire and elastic strip. The object being anodized becomes both anode and cathode at alternate cycles, and the voltage is increased gradually from 20 to about 60 volts. The color of the oxide film is yellow on aluminum and somewhat darker on heavy metal containing alloys; (4) Eloxal WEX is a combination of methods 1 and 3, a.c. and d.c. with the proportion of the two types of current ranging from 20-30 amp./ft.^{2} d.c. at 30 to 60 volts, to 15-20 amp./ft.^{2} a.c. at 40 to 60 volts. Bath temperatures of 20°-30°C. may be used, and operating time is 15 to 20 minutes. Coatings of greater wear resistance are obtained by this method with aluminum-magnesium alloys. High cost limits the use of the processes requiring a.c.

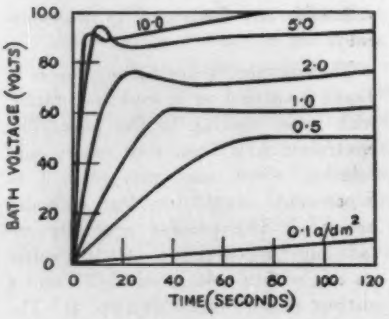


Figure 164

The effect of variations in time, concentration, temperature, and pH on film growth and thickness of the oxide coating in an oxalic acid anodizing solution, is indicated by the same authors in the accompanying graphs. Fig. 164 represents the variations in bath voltage at constant current densities ranging from 1.1 amp./dm.^{2} to 10.0 amp./dm.^{2} d.c. in relation to treatment time in 2 per cent oxalic acid (17°-18°C.). The time for the voltage to become constant, it will be noted, becomes less as the current density is increased. For example, at a current density of 5 amp./dm.^{2} the bath voltage becomes constant at approximately 90 volts in about 20 seconds, whereas, at a current density of 0.5 amp./dm.^{2} nearly 70 seconds, are required to reach a lower constant voltage of about 50 volts. Fig. 165 represents a study of the effect on film thickness, measured in mils, resulting from the use of different concentrations of oxalic acid for a direct current process, with constant voltage ranging from 40 volts to 100 volts. In Fig. 166 these results may be compared with those obtained from constant voltage a.c. (60 volts to 100 volts). The graphs show that higher coating thickness may be obtained by d.c. anodizing.

The effect of temperature and pH of an oxalic acid solution on the film thickness is shown in the three-dimensional graph, Fig. 167. The most favorable anodizing conditions indicated by the curves are found to be at the low temperature range of 25°-40°C. and the corresponding pH value of approximately 0.5 to 1.5. The concentration of oxalic acid for this pH range would be about 3-8 per cent.

H. K. Work has referred to the occasional practice in Germany of adding a small amount of chromic acid to the oxalic acid solution, which, it is believed, results in the formation of chromium oxalate. More recently, the author noted mixtures of sulfuric and oxalic acids have been used for obtaining, at higher temperatures, the

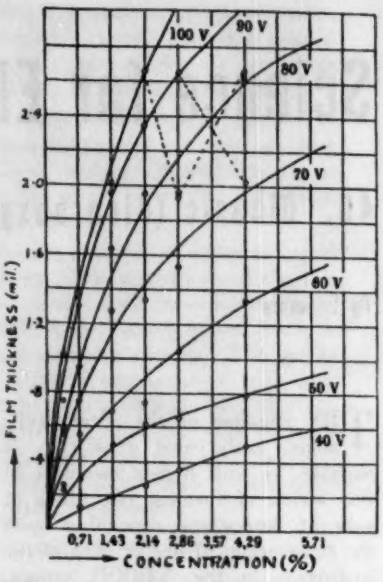


Figure 165

hardness of the sulfuric acid coating together with the white color for commercially pure metal, at the low operating voltage of sulfuric acid.

An improved, patented process for ensuring better adhesion of electrodeposits on aluminum was described stepwise by *W. J. Travers*. Thus: anodizing with a.c. in an aqueous bath containing 4 oz./gal. oxalic acid for ten minutes at 50 V., 20°C., is followed by a 2-15 minute treatment in 8.0 oz./gal. NaCN; water rinsing; then electrodepositing nickel and chromium. Copper or iron, it was claimed, may also be applied.

In a study, based on electron micrographs of the cell and pore dimensions formed in a 2 per cent oxalic acid solution at 75°F., *F. Keller* and associates recorded the following measurements: pore diameter 170Å per volt; number of cells or pores per sq. in. in oxide coatings; at 20 volts 230×10^9, at 40 volts 75×10^9 and at 60 volts 37×10^9.

Wernick and Pinner noted that the addition of oxalic acid to sulfuric acid electrolytes resulted in increased life on the bath.

The use of 2-4 oz./gal. oxalates in a copper pyrophosphate bath has been discussed by *J. F. Stareck*. He considered them an auxiliary constituent, their function being to aid anode corrosion and help maintain the pH of the bath at a determined value.

Succinic Acid

In discussing the use of organic

acids (or their salts) in the process of electroless nickel plating, *A. Brenner* indicated that substitution of certain dibasic aliphatic acids for acetic acid resulted in considerable improvement in the rate of deposition of nickel and the retardation of the spontaneous decomposition of the bath.

Succinic acid, 1,2-ethane dicarboxylic acid, $(CH_2)_2(COOH)_2$, seemed to offer the best compromise with respect to efficiency and economy. The process was explained as follows: the ions of the organic acids form heteropolyacid anions with the hypophosphite ion, $H_2PO_2^-$, and the reducing power of these complex anions is much greater than that of the simple hypophosphite. An added advantage noted, of the use of succinate (salt) in the bath, was the tolerance of a higher concentration of hypophosphite without becoming too unstable. A concentration of 127 g./l. was used.

The rate of deposition, it was found, varied with the pH of the bath. *J. Gutzeit* and *E. J. Ramirez* found that best results were obtained with a pH above 5 from a bath containing: sodium hypophospite ($NaH_2PO_2 \cdot H_2O$) 0.282 mole /l.; sodium succinate ($Na_2C_4H_4O_6 \cdot 6H_2O$) 0.055 mole/l.; nickel ion 0.094 mole/l. Above a pH value of 5, insoluble basic salts precipitated, containing organic material, nickel and phosphorus. Since succinic acid is a weak acid, like acetic, it serves as a buffer.

Tartaric Acid

Tartaric acid is a dihydroxydicarboxylic acid which may be represented as $(CHOH)_2(COOH)_2$ or $H_2C_4H_4O_6$. The mixed potassium-sodium tartrate, $KNaC_4H_4O_6 \cdot 4H_2O$, commonly known as Rochelle Salt, is used in plating bath formulas because, as with most hydroxyacids or their salts, it forms complexes with heavy metals, especially in alkaline solutions as, for example, in the dissolution of the insoluble hydroxides of nickel and iron.

The use of tartrates for increasing anode corrosion in a combination cleaning and plating copper bath was investigated by *O. P. Watts*. He produced evidence that the current efficiency of Weil's solution, consisting of copper sulfate, Rochelle salt and caustic soda, is 100 per cent at both electrodes, at current densities less than 1 amp./dm^2. The deposit, as a result of such low current densities and temperatures, was comparatively thin. *A. K. Graham* and *H. J. Read* noted that the use of tartrates was not fully recognized in 1941, other than for use of the same solution, for a combination cleaning and plating process.

In a comprehensive study of the effect of variations of various factors, such as temperature, pH, current density and concentrations, in a Rochelle salt-copper plating bath, reported by Graham and Read, results showed that a low concentration of free cyanide may be employed at higher current densities and increased current efficiency without affecting anode corrosion. This was attributed to the probable formation of temporary complexes with copper resulting from reactions with products of electrolysis in the anode film. At the cathode, the increased efficiency was ascribed partly to the formation of complexes with basic salts present.

The recommended composition given for a Rochelle cyanide copper plating bath is as follows:

CuCN	3.5 oz./gal.
NaCN	4.6 "
Na_2CO_3	4.0 "
$KNaC_4H_4O_6 \cdot 4H_2O$	6.0 "
Cu	2.5 "
Free NaCN	0.75 "
NaOH	to pH 12.6

Some of the conclusions based on experimental evidence included the following: Insoluble anodes like iron and nickel, together with soluble anodes, will tend to depolarize the copper, thereby permitting higher anode current densities and steady performance. Anodes polarize excessively at a low current density of 20-30 amp./ft.^{2} The suggested arrangement is an insoluble iron anode with less than 5 per cent of total area, since iron present in the bath affects analytical control but not the character or quality of deposit. Anode efficiency is least affected by pH when Rochelle salt concentration is 8 oz./gal. The best range of pH for operational control is 12.0 to 12.8. Free cyanide concentration can be kept low. For a high luster, as in plating die castings, particularly when the copper plate is followed by nickel and chromium, a low copper concentration of 2.5 oz./gal. gives better results. A heavy metal deposit, when luster is not a factor, requires a high temperature, 190°F., and high current density, 60-90 amp./ft.^{2} (8 oz./gal. Rochelle salt). Higher temperatures give higher efficiencies at anode and cathode, with temperatures of 140°-160°F. the recommended range.

C. J. Brockman referred to the use of tartaric acid (or citric acid) in a Watt's type nickel bath as a buffering agent, as well as a means for reducing the nickel ion concentration.

In an investigation of suitable immersion deposits for clean aluminum, *A. H. Beebe* and associates reported that the only satisfactorily immersion plate giving a good high-strength bond was that obtained from sodium zincate solutions. Its function, the authors claimed, was to remove the last traces of aluminum oxide from the work and to act as a protection against further oxidation of the aluminum surface by forming a thin zinc film over the aluminum. One of the favorable zincate dips contained 100 g./l. ZnO and 525 g./l. NaOH, with the addition of ferric chloride and Rochelle salt.

A patented process for electrodepositing a bright lead-zinc alloy, with 0.5-4% zinc content, gives the following composition: 100 g./l. $Zn(CN)_2$; 75-100 g./l. NaOH; 35-40 g./l. NaCN; 3 g./l. basic lead acetate; 25-30 g./l. Rochelle salt; 4-6 g./l. NaF; 3 g./l. gum arabic; 10-20 ml./l. of a betaine; 3 amp./ft.^{2} at 50°C.

A method involving the electrodeposition of tungsten alloys was developed at the National Bureau of Standards in 1947. The cobalt tungsten alloy, it was found, deposited readily. Rochelle salt was included in the bath composition, but other hydroxyacids, it was noted, might be used instead. The process requires tungsten 25 g./l. as

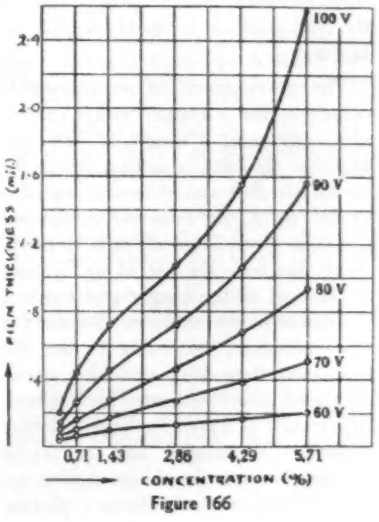


Figure 166

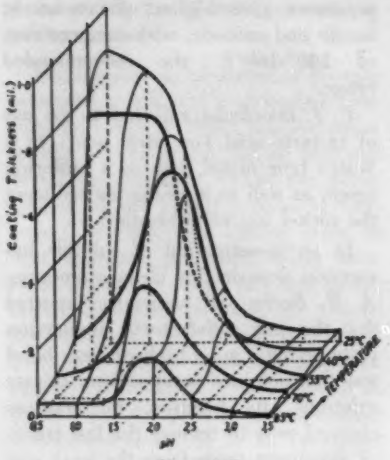


Figure 167

sodium tungstate; cobalt 25 g./l. as the chloride or sulfate; Rochelle salt 400 g./l.; ammonium chloride 50 g./l.; pH 8.5-9.0; temperature 90°C.; C.D. 2-5 amp./dm.^{2}

J. M. Bryan, in discussing the procedure for plating tin on aluminum noted that the tin plating solution which gave best results contained: tin chloride, $SnCl_2 \cdot 2H_2O$, 100 g./l.; Rochelle salt 200 g./l.; hydrolyzed glue 5 g./l.; and NaOH to give a pH of 7.0-7.5. The Rochelle salt reacts with the precipitated tin hydroxide, which forms a soluble complex at the prescribed pH. It is the complex ion which, by suppressing the formation of tin ions and reducing the rate of deposition, accounts, very likely, for the improved plating. Complexation also aids in reducing the loss of tin which could otherwise occur from the formation of insoluble tin hydroxide as a result of hydrolysis. The tin-tartrate complex, which precipitates in the cold solution, is readily soluble on heating.

The development of an acceptable substitute for a copper/nickel/chromium system, as a means of overcoming the difficulty resulting from the continued shortage of nickel, was discussed by *F. A. Lowenheim*. Among the most promising of such developments has been the use of tin bronzes in place of all the copper and some of the nickel in the sequence. Results for this procedure, according to the author, have been confirmed by a group of platers and consumers in England. Superiority of bronze to copper under chromium is claimed, and the bright bronze plate may be chromed directly. The 10 per cent tin bronze plating solution recommended is a cyanide-stannate bath of the following composition: KCN 8.6 oz./gal.; CuCN 3.8 oz./gal.; KOH 1.4 oz./gal.; potassium stannate $K_2SnO_3 \cdot 3H_2O$, 4.7 oz./gal.; Rochelle salt 6.0 oz./gal.; operating conditions include a temperature of 155°F.; cathode C.D. 20-100 amp./ft.^{2}; anode C.D. 20-30 amp./ft.^{2}; copper anodes with up to 20 per cent anode area graphite or stainless steel.

An immersion tin processes for brass and copper lists two formulas for such application. One solution consists of 25 g./l. tin chloride and 10 g./l. tartaric acid. The operating temperature is 80°C. in a barrel unit to which small pieces of zinc metal or powder have been added, and the time is 2-4 hours. The second solution eliminates tin salts and consists of 1.5 g./l. tartaric acid and 3 g./l. sodium chloride. Operation takes place in an enameled iron pan, with the temperature of the solution 85°C. The parts to be tinned are placed in a thin layer on an iron screen and covered with perforated tin sheet. Time is 3-5 hours.

W. Blum and *G. B. Hogaboom* suggested instead of tartaric acid, for tin immersion, the use of cream of tartar, potassium acid tartrate, $KHC_4H_4O_6$, in the same quantities. The principle of deposition, the authors noted, is based upon the formation of a cell when the zinc in the tank is in contact with the brass. The more active zinc becomes the anode (corrodes) and, with brass acting as the cathode, tin is deposited. The tartrates (or acid) will very likely form complex ions, thereby reducing the tin (stannous) ion concentration; hence hydrolysis and precipitation of tin hydroxide will not occur readily. Further, the low tin ion concentration will result in a slow deposition rate. The deposit or coating is, of necessity, thin though fine-grained and bright, but very adherent since deposition (cell action) ceases as soon as the basis metal is coated.

The chemical deposition of a silver film on non-conducting surfaces is accomplished by mixing solution containing an ammoniacal silver nitrate salt with a solution containing a reducing agent. One of the common reducing agents employed for such purposes is Rochelle salt. The reducing solution contains 2 g./l. $AgNO_3$ and 1.7 g./l. Rochelle salt. The usual procedure is to pour or spray both solutions on the surface to be silvered.

A formula for stripping lead or lead alloy anodically from steel, for which 100 per cent theoretical stripping rate is claimed, includes Rochelle salt. The composition and operating conditions include: sodium hydroxide 13.3 oz./gal.; sodium metasilicate Na_2SiO_3 10.0 oz./gal.; Rochelle salt 6.7 oz./gal.; temperature 180°F., anode C.D. 20-40 amp./ft.^{2}

A method for electroplating aluminum holloware with zinc and brass films prior to nickel plating was discussed by *R. Ore*. The neutralizing solution for the step following rinse after brass plating consists of 10% tartaric acid, for 5 seconds at room temperature. After the neutralizer step the holloware is nickel plated.

For electroplating on magnesium or magnesium alloys, a method described by *H. K. DeLong* entailed applying a thin coat of zinc by chemical displacement followed by electrodeposition of copper from a Rochelle salt-copper cyanide type bath. Other metals such as nickel or chromium, may then be deposited.

Citric Acid

Citric acid is a monohydroxy tricarboxylic (basic) acid which is represented by the formula $(CH_2)_2COH(COOH)_3$ and exhibits the characteristics of hydroxy acids in forming complex salts with heavy metals, especially in alkaline solutions.

Deposition of tungsten and tungsten alloys has been found most promising from citric acid base solutions. *R. Pinner* reported the following composition as having yielded best results: sodium tungstate 40-70 g./l.; cobalt sulfate 4-12 g./l.; citric acid 70-150 g./l.; ammonium chloride 50 g./l.; pH range adjusted to 7.5-8.5 with sodium hydroxide; bath temperature 50-75°C.; current density 5-20 amp./dm.^{2} A current efficiency of 21 per cent was obtained, with the deposit containing 60-66 per cent tungsten.

Blum and Hogaboom gave the following composition and conditions for electropolishing stainless steel: citric acid 55-60%; sulfuric acid 15-20%; water 20-30%; anode current density 75-145 amp./ft.^{2}

The nickel plating solution used for plating of aluminum contains: nickel sulfate 16 oz./gal.; sodium sulfate 2.4 oz./gal.; boric acid 1.6 oz./gal.; citric acid 0.4 oz./gal.; sodium citrate 2.4 oz./gal.; pH 5-6; temperature 100°F.; current density 10-20 amp./ft.^{2}

PHOSPHATING TREATMENTS*

A COMPREHENSIVE PATENT LITERATURE SURVEY

PART VI

By Ervin C. Tinsley**

445. *Corrosion Resistant Coated Steel.* By Albert A. Schilling and Walter L. Finlay (Remington Arms Co., Inc.). U. S. 2,448,397. August 31, 1948.

Corrosion resistance of steel surfaces and in particular steel ammunition components having a heavy or light phosphate undercoating can be improved by coating with a furan resin and a thin exterior film of wax. Suitable resins include 2 furfuraldehyde and furfuryl alcohol. The coatings are smooth, water repellant, non-brittle and adherent. Final dip coating in a wax dissolved in a solvent such as carbon tetrachloride provides a superior corrosion-inhibiting surface.

446. *Application of Phosphate Coatings to Nonferrous Metals.* By John C. Lum (Westinghouse Electric Corp.). U. S. 2,449,495. September 14, 1948.

A satisfactory phosphate coating can be rapidly produced on Zn, Cd, and alloys of which these metals predominate by using an aqueous acidic phosphate solution containing 0.10-0.3 dissolved iron. A formulation producing hard phosphate coatings, and which provides a satisfactory basis for subsequent organic finishes contains: iron 0.1 — .30; zinc phosphate 0.04; sodium nitrate 0.2-2.0%; phosphoric acid to supply 1 part free phosphoric acid to 6 parts total phosphate.

Heating the bath to 140-190°F facilitates the reaction. The parts are rinsed in clear water, and rinsed with a chromic acid solution containing 7.5-12 oz. of CrO_3 per 100 gallons.

447. *Rust Preventive Composition.* By Herman D. Kluge and John A. Patterson (The Texas Co.). U. S. 2,452,321. October 25, 1948.

Treats steel surfaces in transportation and storage tanks of petroleum products by using 0.01-3.0% alkyl maleic acid and 0.0001 to 5% alkyl acid phosphate (mono-di-lauryl acid ortho phosphate) in water.

448. *Corrosion Resistant Coating for Metal Surfaces.* By George W. Jernstedt (Westinghouse Electric Co.). U. S. 2,456,947. December 21, 1948.

Activates phosphating compounds by combining disodium phosphate with a water compound of titanium, zirconium, tin or arsenic such as chlorides, hydroxides or sulfates associated with an amine soap. This can act as emulsifying agent for a hydrocarbon solvent dispersion in the compound, and as a result the phosphating compounds act as a cleaner also.

The amine soap is prepared by triethanolamine and fatty acids and is added to the disodium phosphate activatng agent in water.

449. *Protective Phosphate Coatings for Metal Surfaces.* By George W. Jernstedt (Westinghouse Electric Corp.). U. S. 2,462,196. February 22, 1949.

"Activates" the surface treatment effect for Fe, zinc or cadmium metal surfaces by adding to orthodisodium phosphate solutions either water soluble zirconium salts such as halides or sulphates or these together with titanium salts such as chlorides, hydroxide, nitrite or titanium oxalate. These are effective with other phosphates.

The amount of activating metal compounds is given between 0.005% and 20% by weight of zirconium and titanium. After this 10 to 15 second treatment an application is made of a standard manganese phosphate solution.

450. *Accelerating Phosphate Coating With Indigo Compounds.* By William S. Russell (Parker Rust Proof Co.). U. S. 2,463,496. March 1, 1949.

The sodium salt (0.25%) of a thio-indigo disulfonic acid, or the sodium salt of 2 thionaphthene 2-acetophthylene indigo disulfonic acid are used as accelerators of zinc-manganese and iron phosphate solutions.

450A. *Composition for and Method of Producing Phosphate Films on Metals.* By Bryon V. McBride (Westinghouse Electric Corp.). U. S. 2,465,247. March 22, 1949.

In the process of producing phosphate coatings on ferrous, zinc, and cadmium metal surfaces the steps consist in applying a paste-like layer of coating composition composed essentially of 10 to 45 parts by weight of a porous silica aerogel finely divided so that at least 50% passes through a 100 mesh screen, and 100 parts by weight of aqueous phosphate solution having a pH of from 0.5 to 6.0, the phosphate solution composed essentially of from 25% to 70% by weight of a phosphorous compound capable of supplying phosphate ions to react with the metal, and an oxidizing agent, and the balance of the phosphate solution being water, drying the coating, removing the nonadherent layer of silica aerogel produced on drying and exposing a smooth protective phosphate film on the metal surfaces.

451. *A Composition for Preparing Aluminum and the Like for Welding.* By Arthur A. Reid (Reid Engineering Co.). U. S. 2,465,750. March 29, 1949.

A composition for preparing aluminum and aluminum parts for welding comprising a liquid composition consisting of equal parts by volume of each of ortho phosphoric acid, nitric acid and ammonium and also containing a small quantity of a wetting agent; the orthophosphoric being approximately 75-80% U.S.P. the nitric approximately 30-40% U.S.P., and the ammonia (NH_4OH) of 28% strength.

452. *Composition for Treating Metallic Wear Surfaces.* By Harry M. Branberry. U. S. 2,470,136. May 17, 1949.

A new composition of matter for treating metallic wear surfaces which are subjected to the frictional load of another wear surface to improve the load-carrying characteristics hereof and establish compatibility with the second wear surface, which consists of an emulsion of finely divided graphite, a resin binder, a solvent for the resin binder, phosphoric acid, an emulsifier, and water in such amount as to form a water in oil emulsion. The ratio of 100% phosphoric acid to the total weight of binder and graphite, by weight, having a value between 0.10 and 0.80 and the ratio of graphite to binder, by weight, being 2:1 and 3:1.

453. *Method of and Material for Increasing the Corrosion Resistance of Ferriferrous Metals.* By Eugene Snyder (American Chemical Paint Co.). U. S. 2,471,907. May 31, 1949.

A chlorate is used as the accelerator in primary and secondary phosphate of one or more alkali metals or ammonium phosphates. The parts are immersed for 2 minutes in solution maintained at a pH range of 4.5 to 6.5 and consisting of mono-ammonium phosphate 1.85 oz.; di-sodium phosphate 0.15 oz.; water 1 gallon, and .001% sodium chlorate by weight. This improves U. S. patent 2,403,426.

454. *Method of and Material for Preparing Surfaces of Ferriferrous Metals for the Reception of a Siccative Finishing Coat.* By Eugene Snyder (American Chemical Paint Co.). U. S. 2,471,908. May 31, 1949.

To increase the reaction and pH range of U. S. Patent 2,403,476 a very small amount of a soluble peroxide is added to the solution which consists of mono-ammonium phosphate 1.85 oz.; disodium phosphate 0.15%, water 1 gal., and 0.008% by weight of sodium perborate.

455. *Rust Inhibiting Coating Compositions.* By Loy S. Engle and Walter Fikar (Inter-Chemical Corp.). U. S. 2,472,099. June 7, 1949.

A rust-inhibiting composition, consisting essentially the reaction product obtained by heating together, to about 150°C, a heat bodied glyceride oil and an acid alkyl phosphate dissolved in a volatile solvent, there being present from about ½ to 10% by weight alkyl phosphate heat-bodied glyceride oil in at least approximately as great a quantity as the phosphate, but not exceeding about 30% and 70% or more of volatile solvent.

456. *Composition for and Method of Chemically Coating Aluminum.* By Frank S. Spruance, Jr. and James H. Thirsk. (American Chemical Paint Co.). U. S. 2,472,864. June 14, 1949.

In a process of coating aluminum and alloys thereof in which aluminum is the prin-

*The opinions or assertions contained herein are not to be construed as being official or reflecting views of the Department of the Army.

**Ordnance Corps, Metal Finishing Laboratory, Rock Island Arsenal, Rock Island, Ill.

cipal ingredient, the suface is subjected to the following solution: fluoride 0.9 to 12.5; chromic acid 3.75 to 60.0; phosphate plus arsenate (calculated as PO_4) 6.0 to 285.0; and arsenate 0.2 to 3.0 (all figures in grams per liter). The ratio of fluoride ion to dichromate is $F:CrO_3$ or 0.135 to 0.405; and the pH of the solution being between about 1.6 and 2.2.

457. ***Phosphate Treatment for Metals.*** **By E. Snyder (American Chemical Paint Co.). U. S. 2,473,614. (1949)**

A material for use in treating a surface of metal from the group consisting of iron, zinc, aluminum and of iron base, zinc base, and aluminum base alloys the principal active ingredients of which material consists of an intimate admixture of degras and orthophosphoric acid together with a liquid vehicle for said admixture, the quantity of orthophosphoric acid being from 1 to 15% by weight of the degras.

458. ***Process for Protecting Ferrous Metal Surfaces by Coating and Dipping Solution for Use Therein.*** **By Charles W. Clark and John H. Schloem (Canadian Copper Refiners Limited). U. S. 2,475,944. July 12, 1949.**

New modified zinc phosphate solution consisting of zinc oxide, or zinc selenate, zinc selenate, zinc phosphate or zinc chromium selenate (10 to 250 g/l; b) one selenium compound such as selenium dioxide, selenous acid, selenic acid or the alkyl salts of these acids — 1 to 300 g./l; phosphoric acid, 40 to 500 g/l. The time of immersion controls the thickness of coating desired. The temperature of the solution is to be between 90°C and boiling temperature.

459. ***Method of Chemically Coating Metallic Articles of Aluminum or Predominately of Aluminum and Solution for Use Therein.*** **By Charles W. Clark and Thomas G. Collins. (Canadian Copper Refiners Limited). U. S. 2,475,945. July 12, 1949.**

The process of protecting the surfaces of metal articles composed principally of aluminum. The articles to be treated are immersed for a time predetermined in accordance with the thicknesses of the coating to be formed in solution composed of selenium compound 10 to 300 grams; zinc compound (phosphate) 10 to 200 grams; phosphoric acid in concentration of 12½ to 625 grams.

459A. ***Method of Chemically Coating Metallic Articles of Aluminum or Predominately of Aluminum and Solution for Use Therein.*** **By Charles W. Clark and Thomas G. Collins (Canadian Copper Refiners Ltd.). U. S. 2,475,946. July 12, 1949.**

This is a continuation of U. S. 2,475,945 with the exception that an additional ingredient has been added to the coating solution. That is propylene glycol in concentrations from 1 to 5 grams.

460. ***Process for Phosphating Stainless Steel Surfaces.*** **By Arthur Zavarella. U. S. 2,476,345. July 19, 1949.**

1) The surface is hardened by nitriding or carburizing.
2) The surface is "homogenized" by grit-blasting.
3) The surface is then "activated" by dipping in phosphoric acid.
4) The surface is then immersed in a phosphate bath (preferably of Mn base).

461. ***Method of Coating Metal Surfaces Comprising Aluminum.*** **By Herbert K. Ward (Parker Rust Proof Co.). U. S. 2,477,841. August 2, 1949.**

Earlier Thompson (2,312,855) made coating compositions for aluminum employing fluoborate (besides fluosilicate).

This invention by adding an excess of boric acid and fluoborate or sodium fluoride to a phosphate solution containing an oxidizing agent such as a nitrate. The desired acidity is maintained by the excess boric acid.

462. ***Method of Treating Phosphate Coated Surfaces.*** **By Bertha S. Tuttle and T. Navay (J. N. Tuttle, Inc.). U. S. 2,478,954. August 16, 1949.**

Modifies applied phosphate coatings by treatment with a 2 to 25% stannous salt solution to produce dense coating of a tin-metal phosphate complex. This solution has an acidity beyond that which would strip a phosphate coating. To secure the tin-metal phosphate dye complex 0.15 to 10% azine basic type or phthalic anhydride type dyes are used.

463. ***Method of and Materials for Treating Surfaces of Iron, Zinc, and Alloys of Each.*** **By Eugene Snyder (American Chemical Paint Co.). U. S. 2,479,423. August 16, 1949.**

To produce a paint-bonding surface the parts are treated in a diluted solution of alkali or ammonium phosphate (0.835 lbs.), secondary alkali or ammonium phosphate (0.045 lbs.), normal aluminum (or ferric) phosphate (0.010 lbs.), sulfonated castor oil (0.080 lbs.), oleyl alcohol (0.010 lbs.), pine oil (0.20 lbs.) plus a detergent (.055 lbs). This solution operates at pH 5 to 6.

464. ***Phosphate Coating of Metallic Articles.*** **By Lloyd O. Gilbert. U. S. 2,479,564. August 23, 1949.**

Adds to phosphate coating solutions boron compounds. It is used in phosphoric acid and zinc (or manganese or copper) phosphates and addition of boron phosphate (3 lbs. to about 240 gallons of said solution. Operating temperature 205-210° F).

465. ***Metal Protective Coating Method.*** **By Lionel Cinamon. U. S. 2,481,977. September 13, 1949.**

The parts are treated in a solution consisting of 1-20 parts tetra sodium pyro phosphate, ½-10 parts sodium meta-silicate, ¼-5 parts tri-sodium phosphate. This non-acidic solution operates from room temperature to 180° F.

466. ***Coating Ferrous Metal Sheets With an Insulating Film.*** **By Fritz J. Nagel and Clifford C. Horstman. (Westinghouse Electric Corp.). U. S. 2,484,242. October 11, 1949.**

To produce on the steel surfaces high ohmic resistance films a solution consisting of 30 parts phosphoric acid containing an organic ester of silicic acid, which can form by decomposition silicon dioxide. Add 50 to 400 parts solvent (aliphatic alcohol) suitable for bath. Apply 1-10 gals. of the solution to 1 ton of 13 mil. thick sheets and heat the sheets between 300 to 900° C. to produce the desired film.

467. ***Producing Coatings on Metal.*** **By George R. Hoover and N. Cox (Armco Steel Corp.). U. S. 2,487,137. November 8, 1949.**

Accelerates phosphate treatments by adding to an acid metal phosphate solution, containing 0.3 to 2.65% of an oxidizing agent such as nitrate or fluorine enough salts of the hydrochloric acid to have 0.015 to 0.80% by weight fluorine present in the solutions. This bath is operated at 120° F to 210° F for 5 seconds to 1 minute.

468. ***Cleaning and Activating Compositions and Use Thereof in Producing Protective Phosphate Coatings on Metal Surfaces.*** **By George W. Jernstedt (Westinghouse Electric Co.). U. S. 2,490,062. December 6, 1949.**

A multi-purpose treatment which cleans and produces a coating on ferrous, zinc, cadmium and aluminum metals. The solution consists of 0.005 to 20% water-soluble compound of titanium, zirconium, lead and tin. The balance is disodium orthophosphate and an alkali cleaning compound such as hydroxides, bi-carbonates, borates, phosphates, etc., to provide a pH from 10 to 12.5.

469. ***Production of Silicon Steel Sheet Stock Having High Surface Resistivity and Resistance to Adhesion.*** **By Carl E. Gifford (Armco Steel Corp.). U. S. 2,492,095. December 20, 1949.**

A process of treating ferrous magnetic materials to give them high surface resistivity and to prevent adhesion between lamina thereof which comprises treating the clean surfaces of ferrous materials with a solution of phosphoric acid in which 7 to 50% by weight is the acid, said solution having in mechanical suspension finely divided mica, controlling the quantity of residual solution remaining on the surfaces of the material to a film of uniform thickness and subjecting the materials to heat treatment at a temperature of 700-1400° F.

470. ***Aqueous Compositions for Treating Iron and Steel.*** **By Donald W. Vance (Kelite Products, Inc.). U. S. 2,493,327. January 3, 1950.**

A multipurpose solution which removes rust and provides a phosphate coating. This solution is composed of phosphoric acid (7.4-18.4%), formic acid (0.6-1.5%), zinc (0.025 to .06%), wetting agent (0.05 to 0.12%), organic grease dissolving solvent (0.9 to 2.4%) and water the remaining percentage.

471. ***Method of Preparing Aluminum Plates to Receive Silver Halide Emulsion.*** **By Bennett F. Terry. U. S. 2,494,729. January 17, 1950.**

The method of treating the surface of aluminum plates to condition them to be substantially impervious to the reacting constituents of a silver halide emulsion coating, which consists of subjecting said surfaces to the action of a solution of water and disodium phosphate for a period of time greater than ten minutes, the solution being at an elevated temperature. The said surface is thoroughly washed and the final step is coating said surface with said emulsion.

472. ***Method of Coating Ferriferrous and Zinciferrous Metals.*** **By Frank P. Spruance and James H. Thirsk. (American Chemical Paint Co.). U. S. 2,494,908. January 17, 1950.**

The treating solution consists of phosphoric acid (or a mono-alkali salt) (2 to 285 grams); chromic acid (or alkali chromate) 3.75 to 60 grams; sodium fluoride 0.9 to 12.5 grams; water to make a liter.

Compares almost identical to U. S. Patent 2,438,977 (March 30, 1948).

473. ***Chromate — Phosphate Coating for Aluminum.*** **By F. P. Spruance (American Chemical Paint Co.). U. S. 2,494,910. (1950)**

In a process for coating metal chosen from the group consisting of aluminum and alloys thereof in which aluminum is the principal ingredient with an adherent coating, the step which consists in subjecting the metal to the action of an aqueous solution the essential active, coating-producing ingredients of which are fluoride ion, dichromate ion and phosphate ion, the ions being present in amounts equivalent to phosphate ion 1.5 to 300, dichromate ion 3.5 to 150, and fluoride ion 0.75 to 95 (grams per liter). The ratio of the dichromate ion to fluoride ion is 1.0 3.75 and 5.45 and the pH of the solution measured colorimetrically lying between 3.2 and 7.0.

474. ***Compositions and Methods for Depositing Amorphous Metal Phosphate Coatings on Metal Surfaces.*** **By Harold I. Rosenbloom (Hall Lab., Inc). U. S. 2,499,261. February 28, 1950.**

The parts are treated in a solution composed of a mixture of 54.6% alkali metal phosphate, 38.6% calcium chloride (78% pure), 6.1% sodium acid sulfate, and about 0.7% sodium dichromate. Prepare a 2.5% water solution of this mixture and treat for 10 seconds at 25° C.

475. ***Process of Producing a Phosphate Coating on Metals High in Aluminum.*** **By R. C. Gibson and W. S. Russell (Parker Rust Proof Co.). U. S. 2,500,673. March 14, 1950.**

Aluminum surfaces can be phosphated with a solution based on these essential ingredients: 1 (acid phosphate) 2 (fluoborate) 3 (an oxidizing agent). The fluoride is used to remove excess aluminum as Na_3AlF_6. A typical bath consists of 370 lbs. phosphoric acid (75%), 715 lbs. of nitric acid (42°Be), 425 lbs. of zinc oxide, 180 lbs. of boric acid, 165 lbs. of HF (160%), 170 of sodium bifluoride, and water to test 46.5° Be at 80° F.

476. ***Method of Producing Ferrous Sheet for Manufacturing Receptables.*** **By R. R. Tanner (Parker Rust Proof Co.). U. S. 2,500,915. March 14, 1950.**

A method for preparing sheet iron by first applying a solderable metal (tin) along positions which are to be soldered and then phosphate treating the entire surface by a roller coating process. The phosphate treating consists of the following: chlorate 1%, nitrate 0.3-0.1%, copper 0.004 to 0.008%, zinc 0.5% and phosphate 0.8 to 1.0%. The solution is operated at a temperature of 160° F and a pH of 2.2

477. ***Insulation for Magnetic Material.*** **By F. J. Nagel and C. H. Horstman (Westinghouse Electric Corp.). U. S. 2,501,349. March 21, 1950.**

A phosphate film of high ohmic resistance is produced by immersing the work in a solution consisting of fluosilicic acid, phosphoric acid, and water. Silicotungstic or phosphotungstic acid can be used instead of fluosilicic acid. This coating is then heat treated at a temperature of 400 - 1200° C to produce the insulating film.

478. ***Production of Silicon Steel Sheet Stock Having the Property of High Surface Resistivity.*** **By C. E. Gifford (Armco Steel Corp). U. S. 2,501,846. March 28, 1950.**

An insulative surface coating for silicon steel stock is produced by cleaning the surface with a 7 to 50% solution of phosphoric acid. A thin uniform thickness coating is formed. Then the steel is heated from 400 to 1000° F for developing magnetic properties. The phosphoric acid reacts with the magnetic sheet to form an insulative coating.

479. ***Phosphate Coating of Metals.*** **By S. R. Dodd and R. F. Ayers (Oakite Products, Inc.). U. S. 2,502,441. April 4, 1950.**

The parts are immersed at a pH 3.2 to 5.5 and sprayed at a pH range of 4.8 to 5.2 in a 2% water solution of mixture consisting of an acid salt of phosphoric acid (90%), a water-soluble compound of molybic acid or tungstic acid (1%), a phenol such as Quebracho, plus a wetting agent.

480. ***Method of Producing a Corrosion Inhibitive Coating on Ferrous Metals.*** **By H. R. Moore. U. S. 2,505,785. May 2, 1950.**

The parts are immersed for 1 to 20 min. in a 195 to 205° F solution consisting of 0.78% sodium dichromate (tech), 0.59% phosphoric acid (75 or 85%), 0.002 — 2% ferric chromic phosphate.

481. ***Coating of Metal Surfaces.*** **By P. Amundsen (Parker Rust Proof Co.). U. S. 2,514,149. July 4, 1950.**

A method of producing a fast rate in phosphate treatment with the minimum of loss due to sludging. To do this a two stage process was used. The first bath consists of an acid phosphate solution of high iron and low zinc content (ratio of zinc to iron 1-10 to 1-2). The second bath is an acid phosphate solution with the zinc to iron ratio reversed.

It is high in zinc and low in iron at ratio of 2 to 1 to 10 to 1. The immersion time in both baths is 10 to 20 minutes.

482. ***Process for Increasing the Corrosion-Resistance of Metals.*** **By R. F. Drysdale and R. W. Parker (England). (The Walterisation Co. Limited). U. S. 2,514,941. July 11, 1950.**

Small amounts of one or more complex anhydrous ammonium metallic phosphates are added into phosphate solutions. All these complex phosphates have all the metal in the anion. Examples of the complex phosphates are: ammonium anhydrous cobalt phosphate, ammonium anhydrous magnesium phosphate, ammonium anhydrous cadmium phosphate, or ammonium anhydrous zinc phosphate. This process obtains an extremely finely grained, uniform texture of greater density and lower porosity than normally produced phosphate coatings.

483. ***Phosphate Coating of Metal Articles.*** **By H. G. Vernes and L. S. Wood (Du-Lite Chemical Corp.). U. S. 2,515,934. July 18, 1950.**

Use a phosphating liquid in an organic vehicle, such as 1% to 7% (preferred 3%) 85% phosphoric acid in a 50:50 mixture of acetone and carbon tetrachloride. This is applied by immersion or spraying.

484. ***Composition and Process for Treating Metal Surfaces.*** **By J. C. Lum (Westinghouse Electric Corp.). U. S. 2,516,008. July 18, 1950.**

The parts are pre-treated by the use of a combination of the following: (1) 0.1 to 10 parts by weight of an activator (water, a disodium ortho phosphate, and a water soluble compound of titanium, zirconium, and titanium potassium oxalate). (2) 0.002 to .5 parts of stabilizer (citric acid, tartaric acid, oxalic acid), (3) from 2 to 20 parts of a cleaning solution sodium sesquisilicate, trisodium phosphate. After this pretreatment a zinc or manganese phosphate coating is applied.

485. ***Method and Material for Treating Ferriferrous Metal Surfaces With Manganese Phosphate Coating Solutions.*** **By Joseph Mazia (American Chemical Paint Co.). U. S. 2,516,139. July 25, 1950.**

Avoids the "sludging out" of an acid manganese phosphate bath by adding ions of a tartaric acid other than meso tartaric acid. (0.5 to 15 grams per liter of tartrate ions as tartaric acids).

486. ***Drawing Ferrous Wire and Other Metalworking Processes.*** **By Harry A. Ashton & John T. Setterington (Parker Rust Proof Co.). U. S. 2,522,176. September 12, 1950.**

In the method of working ferrous metals by operations involving plastic deformation of the metal wherein the metal has a coating of crystalline phosphate of the type formed by the interaction of the metal surface with an acidic phosphate the improvement which comprises facilitating the working by forming on the said phosphate coating a dry coating of at least one compound selected from the group consisting of oxides and hydroxides of the alkaline earth metals.

487. ***Coating Compositions for Metals.*** **By Leo R. Whiting and Phillip F. Wangner, Jr. U. S. 2,525,107. October 10, 1950.**

Phosphate type coating compositions having superior corrosion resistance can be formed by combining phosphoric acid with a resinous material containing active hydroxyl groups, such as polyvinyl, butyral, and dissolving the combination in suitable organic solvents. The addition of pigments particularly "zinc tetroxy chromate," gives further improvement.

An effective composition for protective steel, zinc, and aluminum surfaces contains by weight 2.24 parts phosphoric acid 85%, 8.96 parts polyvinyl-butyral resin, 8.54 parts zinc tetroxyl chromate, 1.42 parts silica, 0.08 parts carbon black, and 81.0 parts butanol.

SHOP PROBLEMS

BARREL FINISHING — POLISHING AND BUFFING
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METAL FINISHING publishes, each month, a portion of the inquiries answered as a service to subscribers. If any reader disagrees with the answers or knows of better or more information on the problem discussed, the information will be gratefully received and the sender's name will be kept confidential, if desired.

Coloring Gun Barrels

Question: I need a formula for bluing double-barrel shot guns. The usual caustic-nitrate is too hot and causes a weakening of the soldered rib on these guns. Would the adding of sodium cyanide and lowering the temperature of the bath do it?

C. B. V.

Answer: The temperature of the caustic blackening baths can only be lowered a few degrees without affecting their action. The best method is to use a soft solder with a higher melting point. These solders are available from most solder manufacturers.

The only suitable method of coloring gun barrels, in addition to the caustic black process, is the old browning process, which involves the use of a humidity cabinet and hot box. This is a very slow, involved procedure but we will be pleased to forward details, if you are interested.

Refinishing Dental Instruments

Question: Before nickel plating used dental forceps we have great difficulty in removing all the heavy rust out of their boxlocks. We have tried acids, alkaline rust strippers and, while they all remove some of the rust, enough remains to show up after sterilization, spoiling our work. We would be thankful for any suggestion that would help us with our problem.

P. E. V.

Answer: We question whether the rust which shows up on sterilization is due to incomplete removal from the box-locks during replating. Since the nickel stripping, cleaning, and pickling operations leave the surface chemically clean and the nickel deposit does not throw into the recesses of the locks, there will remain an unprotected steel area in this location. This unprotected area will rust quite readily.

Our suggestion is to blow out the locks after refinishing, using an air blast, then dry well and oil.

Iron in Acid Copper Solution

Question: Is there a method for removing dissolved iron from acid copper plating solutions? I understand that this could probably be done with ion-exchange units, but that such equipment would not be economically feasible for the very occasional iron contamination we encounter in our rotogravure plating operation.

G. L. H.

Answer: Small amounts of iron contamination ordinarily will have no effect on the copper deposit. Its removal, however, will require oxidation of the iron by bubbling air through the solution, followed by neutralization of the free sulfuric acid content with cupric oxide or hydroxide to a pH slightly above 4.7, to precipitate ferric hydroxide.

Since the value of the solution is only about 35c per gallon, it is questionable whether purification will be economical, considering the chemicals and labor required, together with the unavoidable loss of some solution. If sufficient iron accumulates to cause trouble, dumping part of the solution would seem to be the most efficient course.

Plating Nickel Over Nickel

Question: In one plant where I was employed on hard nickel plating, the procedure was to clean and then etch with reverse current in 25% sulfuric acid solution at 40, then 200 amp./sq. ft. before plating. When the parts were removed from the nickel bath for checking size, they were then anodized in an all chloride nickel, then flash plated before putting back in the nickel tank. I was told this was necessary to get proper adhesion.

In my present job, before replating we etch in the sulfuric acid at 8 volts and I have been told the all chloride nickel step is not necessary. Since I am not at liberty to experiment on my own, I would like your opinion.

Also, I was taught to always use a silver strike before silver plating. In this shop we go right into the silver plating solution with copper and without the current on.

Can you also advise on the proper procedure for hard chrome over brass?

A. J.

Answer: When the current is interrupted during hard nickel plating, it is advisable to reactivate the nickel surface before replating. This activation is performed in a number of ways, including reverse sulfuric acid etch, all chloride acid nickel strike, or reverse current in the chloride bath, followed by the strike. The nickel chloride strike is very effective and details on all these procedures will be found in the METAL FINISHING GUIDEBOOK.

In silver plating, if the plating solution is low in metal and high in cyanide, it is possible to obtain satisfactory adhesion on copper without using a strike, but this is a dangerous practice and is not recommended. This type of plating solution is usable only for thin silver deposits and at low current density because of burning due to low metal content.

There is no special procedure for hard chromium plating on brass. It should be remembered, however, that the chromium will tend to crack readily because of the relative softness of the base.

Darkening of Lacquered Brass

Question: Lately we have been brass plating and lacquering wire goods and are experiencing some difficulty in the finish after two or three weeks. Our

procedure is as follows: bright nickel plate, brass flash and drying, followed by lacquer dip.

Our finish at the present time is good, and all parts have a good yellow appearance but, after a week or two, this yellow gives way to a more reddish or bronze appearance. At first we thought it was our rinsing and lacquer but we are doing a good rinse job and the lacquer is of a high grade.

Is there any other factor which we can check on to eliminate this fading of color?

H. G. S.

Answer: Darkening of brass deposits under the lacquer film is generally due to an insufficient thickness of lacquer, which results in penetration by atmospheric oxidants. Even a high quality lacquer will permit this action if it is thinned down too much, as is often the case when dip lacquering.

The dry film thickness of the lacquer coating on the parts should be checked and modified, if necessary.

Flow Coated Paint Film

Question: Is the adhesion of a flow coated paint film superior to that of an air sprayed paint film on a phosphated steel base?

W. L. P.

Answer: With the phosphated coating being identical in both cases, and with optimum paint formulations for each of the application methods being used, no significant difference in adhesion properties will be evident.

Stress Relief

Question: In connection with hard chrome plating of cutting tools we understand that a stress relieving treatment is desirable after the plating operation. Will you please tell us where we may find detailed information about this stress relieving operation and where we might obtain the necessary equipment for it.

T. T. S.

Answer: Stress relieving after chromium plating involves heating at 350-400° F. in an oven or oil bath. No special equipment is needed.

A typical specification (Federal, QQ-C-320) calls for baking for not less than 3 hours at the above temperature, for parts which have a hardness of Rockwell C40 or above.

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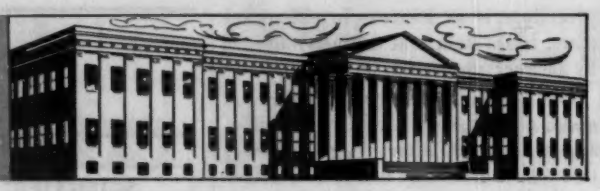
RECENTLY GRANTED PATENTS IN THE METAL FINISHING FIELD



Organic Coating

U. S. Patent 2,823,143. *Feb.* 11, 1958. *F. R. Upperman, assignor to The Glidden Co.*

The method of curing and rapidly developing film-forming properties in an organic liquid coating composition of the type which exhibits substantially no film-forming properties until mixed with liquid catalyst of appropriate kind and critical small amount, said method comprising the step of projecting said liquid coating composition in atomized form from the nozzle of a single-nozzle spray gun solely by means of compressed gas carrying the needed liquid catalyst homogeneously dispersed therein in amounts sufficient to supply all of the catalyst required to cure the entire quantity of coating composition which is atomized per unit of time from said nozzle by the compressed gas which issues from said nozzle in the same unit of time.

Fused Bath Descaling

U. S. Patent 2,823,150. *Feb.* 11, 1958. *J. A. Hendricks, assignor to Devex Corp.*

A method of descaling ferrous metal by holding the scaled metal in a bath of fused sodium hydroxide activated by 1% to 5% elemental sulfur and then quenching the work in water and subsequently pickling off the scale residues in an acid bath.

Solvent-Vapor Degreaser

U. S. Patent 2,823,174. *Feb.* 11, 1958. *M. G. Pickett, assignor to G. S. Blakeslee & Co.*

A tank having an enclosing wall and adapted to contain a degreasing solvent and vapors thereof, cooling jacket means extending about said tank exteriorly and remote from the bottom thereof, said jacket means comprising upper and lower channel elements and an intermediate channel element fixed to said upper and lower elements and to the tank wall.

Antimony Bath

U. S. Patent 2,823,176. *Feb.* 11, 1958. *E. R. Breining, C. F. Nixon and W. R. Vincent, assignors to General Motors Corp.*

An electroplating bath comprising approximately 20 to 300 grams per liter of solution of antimony, a metallic cation in addition to antimony in a small amount effective to provide a smooth, adherent, non-brittle antimony plate up to the maximum amount soluble in the plating bath, and a complexing agent capable of complexing dissolved antimony to form a five-membered ring, wherein said ring-forming complexing agent is sulfonated catechol present in approximately 20 to 300 grams per liter of solution.

Acid Pickling Inhibitor

U. S. Patent 2,823,184. *Feb.* 11, 1958. *R. E. Plump, and J. W. Carroll, assignors to Pennsalt Chemicals Corp.*

A pickling bath comprising an aqueous solution of a non-oxidizing inorganic pickling acid, said solution containing 0.001 to 7% by weight of the condensation product resulting from an acidified reaction mixture of sulfite pulp waste liquor, water-soluble aldehyde, urea and thiourea in which reaction mixture 0.1 to 5 mols of aldehyde are present per mol of combined urea and thiourea and said sulfite pulp waste liquor contains not more than 1 gram of sulfite pulp waste liquor solids per gram of combined urea and thiourea.

Hammer Finish

U. S. Patent 2,823,190. *Feb.* 11, 1958. *A. Marcis and P. D. Haas, assignors to The Glidden Co.*

A resinous film-forming material particularly adapted for use as the film-forming component of a hammer finish for metals, said material being the homogeneous, single-phase reaction product resulting from heating together the following kinds and amounts of materials as the principal solids-engendering ingredients thereof: (A) vinyl toluene in amounts between about 10 and 60% by weight; (B) divinylbenzene in amounts between about .1% and 2% by weight; and (C) as the remainder, oil-modified alkyd resin containing ethylenic unsaturation, said oil-modified alkyd resin being a reaction product (*a*) in which the combined oil acids thereof are monocarboxylic acids of 6 to 24 carbons and are present in amounts equivalent to from about 25% to about 45%, by weight on said resinous film-forming material, of triglyceride oil selected from the group consisting of drying oils, semi-drying oils, and mixtures thereof; and (*b*) in which the remaining components thereof amount to between about 13% and 65%, by weight on said resinous film-forming material.

Paint Roller

U. S. Patent 2,823,402. *Feb.* 18, 1958. *L. H. Phillips*

A roller-type paint applicator for fence elements.

Hot Dipping

U. S. Patent 2,823,641. *Feb.* 18, 1958. *N. E. Cook and S. L. Norteman, assignors to Wheeling Steel Corp.*

Apparatus for coating metal strip with coating metal having a lower melting point than the metal of the strip.

Parts Washer

U. S. Patent 2,824,029. *Feb.* 18, 1958. *M. J. Zinty, assignor to Magnus Chemical Co., Inc.*

The method of washing a substantially cylindrical article having transversely opening cavities which comprises immersing the article in a washing liquid and simultaneaously rotating the article about its own axis, rotating the article about a second axis disposed at an angle to the axis of the article and bodily reciprocating the article.

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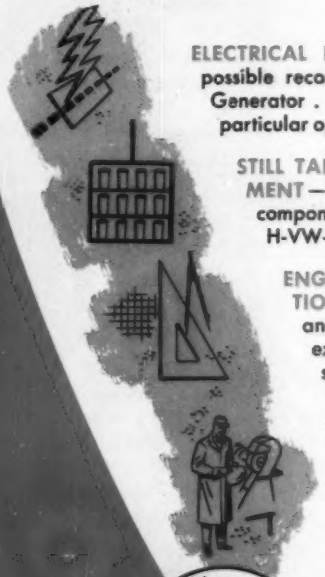

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ALUMINUM FINISHING SUPPLIES — Page 4 shows how H-VW-M research has resulted in new compounds, improved buffs and cleaners to make aluminum finishing easier, better.

HANSON-VAN WINKLE-MUNNING CO. · MATAWAN, NEW JERSEY, U.S.A.

HANSON-VAN WINKLE-MUNNING COMPANY

MATAWAN, NEW JERSEY

Manufacturers of a complete line of electroplating and polishing processes, equipment and supplies

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These H-VW-M Anodizing and Finishing to New Savings, New Efficiency, New

ELECTRICAL EQUIPMENT

H-VW-M is the only manufacturer of both Germanium and Selenium Rectifiers *and* low voltage, direct current Motor Generator Sets for the metal finishing industry. This thorough experience in every phase of low voltage power generation and rectification means that when you bring your power problems to H-VW-M you're sure to get the perfect equipment recommendation.

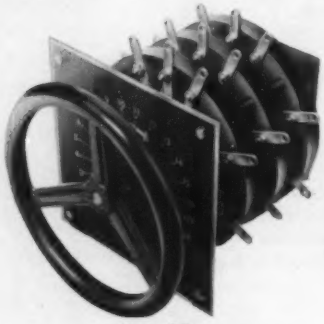
Self-Contained Rectifier with Tap Switch Control

Remote Controlled Rectifier with Tap Switch Control

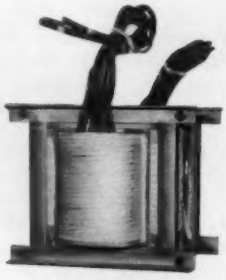
Germanium and Selenium Rectifiers . . . Rectifier Controls

Highest quality and efficiency, flexibility, economy and low maintenance are the characteristics combined in H-VW-M's full line of both Germanium and Selenium Rectifiers. 6 to 48 volt units—both remote and self-contained—provide the exact direct current low-voltage and high amperage required in aluminum anodizing. The widest possible choice of controls and control combinations is available. Such devices as manual or motor operated tap switch controls, continuously variable auto-transformers and saturable core reactors are used with or without supplemental controls to provide automatic voltage stabilization, automatic constant current as well as automatic programming.

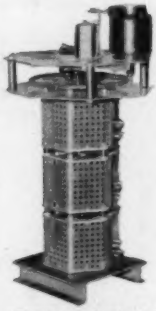
Write for Bulletin ER-108, which gives further information about Rectifiers and Controls, plus useful control application suggestions.



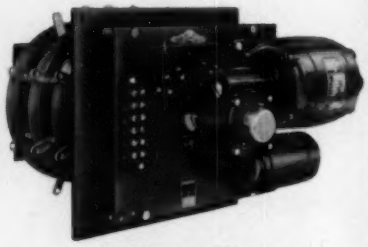
Manual Tap Switch Control



Saturable Core Reactor



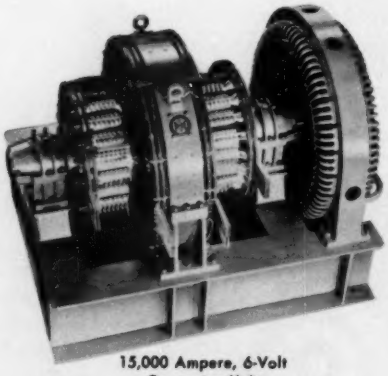
Continuously Variable Auto-Transformer



Motor Operated Tap Switch Control

Generators . . . and Controls

H-VW-M Motor Generators designed especially for metal finishing operations are built in sizes up to 50,000 amperes, and accessory equipment includes a full line of controls and control panels to cover any desired control function. Easy-to-maintain H-VW-M Motor Generators have exceptionally rugged and practical construction features insuring maximum performance and life. Standard voltage ratings range from 6 to 50 volts, and include the 18 and 24 volt units usually required for sulphuric acid anodizing, plus the 40 and 50 volt units used in chromic acid anodizing. Write today for 24-page Bulletin G-104, covering in detail all H-VW-M Generators.



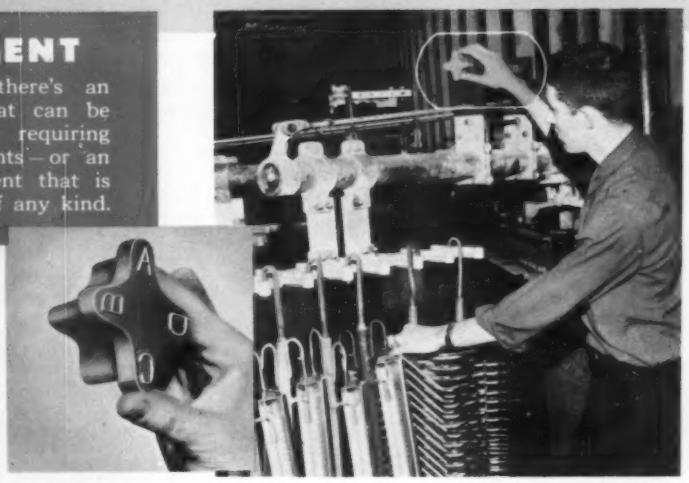
15,000 Ampere, 6-Volt Generator Unit

Automatic Anodizing Control Panel

Supplies, Equipment and Services Add Up Simplicity of Operation in Your Plant

PROCESSING EQUIPMENT

Whatever your anodizing procedure, there's an H-VW-M Full Automatic Conveyor that can be adapted to any production application requiring automatic cycling of individual treatments—or an H-VW-M Tank with accessory equipment that is perfectly adapted to still tank methods of any kind.



Workman "dials" desired cycle in refrigerator plant. Parts will by-pass or lower into baths as dial setting dictates.

Automation in Metalfinishing— *Full Automatic Conveyors with Dial-A-Cycle*

H-VW-M's new DIAL-A-CYCLE system automates nine or more complete metalfinishing processes on a single anodizing or electroplating machine. This revolutionary by-pass mechanism can be used on any metalfinishing installation for anodizing, electroplating, or similar processing. It is especially useful and effects substantial cost reductions when a variety of parts requires several different processes or colors.

DIAL-A-CYCLE, as the name implies, is controlled by a simple dial setting. The dial is mounted on the carrier arm that carries the parts through processing tanks. It is set by the machine operator for the processing steps through which each load of unfinished parts is to move. Automatic conveying then takes over, lowering the parts into the required tanks and bypassing others.

Different products, requiring different anodizing cycles, may be processed at the same time, with the same equipment. DIAL-A-CYCLE gives you new versatility while reducing operating, labor, and maintenance costs. Close, automatic control of transfer and immersion periods improves quality.

DIAL-A-CYCLE is the newest of many types of conveyors and equipment H-VW-M supplies to aluminum finishers. H-VW-M also designs, manufactures, and installs return-type conveyors . . . elevator conveyors . . . straight-line conveyors . . . and others. For a complete description of all types, write for Bulletin FA-105.

Tanks and Equipment

At H-VW-M—the plating and anodizing industry's workshop—you'll find tank equipment for every phase of your work. For chromic acid anodizing, H-VW-M double electric welded unlined steel tanks are offered, along with steel coil equipment for cooling and heating. The entire system is H-VW-M designed, supplied and installed. For sulphuric acid anodizing, lead-lined steel tanks, plus the necessary cooling coils and air agitation assembly, are supplied. Tanks are fabricated from hot rolled steel, stainless steel, and aluminum. Other types of tanks are also available. Bulletin No. T-108 gives full particulars about this important H-VW-M equipment. Every conceivable type of auxiliary equipment is engineered and supplied, according to customers specifications, including a complete packaged refrigeration system for anodizing solutions.

And H-VW-M's Engineering and Installation Service

Anodizing problems of *any* kind? H-VW-M is prepared to set up your entire anodizing system from beginning to end—a system made up of components scientifically engineered to work together with utmost efficiency. Because of this, and because of H-VW-M's continuing research and development in every aspect of the anodizing picture, you can be confident that the recommendation you receive from H-VW-M is the very *best*.

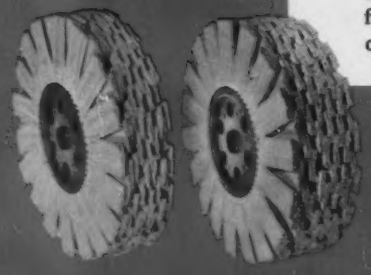
What's more, if requested, H-VW-M sees to it that the equipment you buy is H-VW-M *installed*. This means perfect, efficient operation from the start.

Add to this the fact that an H-VW-M technical representative—ready to serve you—is no further than your telephone. These representatives serve in principal cities across the nation. Get to know the one nearest you. He can help you get the most from your aluminum finishing equipment and supplies.

TURN THE PAGE FOR ALUMINUM BUFFING AND CLEANING SUPPLIES

ALUMINUM BUFFING AND CLEANING SUPPLIES

Since aluminum came into its own after World War II, considerable H-VW-M research and development work has been devoted to the perfection of buffs and compounds suiting the unique physical characteristics of this popular light metal. When long-wearing H-VW-M Buffs are used in conjunction with H-VW-M compounds especially formulated for aluminum finishing, you have the perfectly balanced combination for economy, efficiency and quality performance.



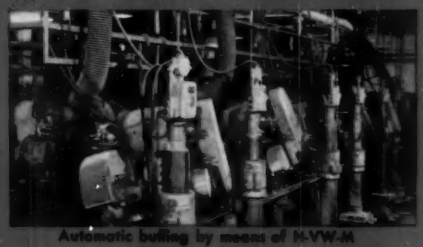
Buffs

Nowhere will you find a wider selection of the buffs you need for preanodizing operations than at H-VW-M. Whether you're looking for a super-heavy-duty buff like new steel-centered Ruff-L-Buffs (which are available untreated, or Binderized® for extra long wear) medium duty buffs like Triplex Buffs, or a buff for medium-to-light service such as the Full Disc Buff, you need look no further than H-VW-M. The full H-VW-M line also includes new Tufta-Flex Buffs (cloth tufts) and Sisal-Flex Buffs (with sisal-centered tufts).

Among this array you'll find the exact buffs for your aluminum finishing needs. Every one is characterized by first quality, uniform new material of close weave and good weight . . . tight sewing with heavy thread . . . and proper balance. Write for 12 page Bulletin B-103, which describes H-VW-M's entire buff line.

Compounds

Hand buffing using H-VW-M buffs, compounds



Automatic buffing by means of H-VW-M Liquimatic System.

For heavy duty cutting, H-VW-M Liquid Tripoli Compounds 303 and 420 were developed, and are now widely used in the cooking utensil industry. For the appliance, storm window, construction materials and automotive fields, H-VW-M's new Liquimatic Liquid Compound No. 728 has proved especially successful, giving excellent cut, while leaving the surface with deep, high color.

H-VW-M Bar Compounds also find broad use in aluminum finishing. A variety of tripoli bar compounds are offered in varying consistencies to meet all cutting requirements. For cut and color, special white compounds are available. And for high color, several new H-VW-M aluminum oxide compounds—No.'s 6-B-168, 6-B-72 and 8390—give unusually good results. Write for Bulletin CO-103.

Cleaners

H-VW-M devotes constant research to the subject of cleaners in its search for ever better products in the aluminum finishing field.

Matawan Cleaners are designed specifically to give superior results in soak cleaning, power spray operations, oxide removal, and for special aluminum cleaning and etching operations. Of particular interest is H-VW-M's 85S Cleaner, which prevents scale formation, thus keeping coil and tank walls scale free. This unusual aluminum cleaner leaves an extremely bright surface, and, because of its built-in regenerator, makes maximum effective use of caustic in the bath.

In line with its desire to supply the exact cleaner for the job, H-VW-M offers its extensive laboratory facilities where circumstances demand a special cleaner.

When you think of aluminum finishing equipment and supplies—think of H-VW-M first. Buying from one dependable source . . . H-VW-M . . . means one company assumes full responsibility—your guarantee that you're getting the best . . . in products . . . in performance, in *extra* service.

PLATEMANSHIP

Your H-VW-M combination—of the most modern testing and development laboratory—of over 80 years experience in every phase of plating and polishing—of a complete equipment, process and supply line for every need.

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H-VW-M

INDUSTRY'S WORKSHOP FOR THE FINEST IN PLATING AND POLISHING PROCESSES • EQUIPMENT • SUPPLIES

4758

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Hot Dipping

U. S. Patent 2,824,021. *Feb.* 18, 1958. *N. E. Cook and S. L. Norteman, assignors to Wheeling Steel Corp.*

A method of tight coat dip galvanizing metal strip by use of a molten coating bath comprising molten zinc and at least one other molten metal admixed with the molten zinc to provide metal strip having a tight galvanized coating.

Conversion Coating

U. S. Patent 2,824,031. *Feb.* 18, 1958. *J. E. Stareck, assignor to Metal & Thermit Corp.*

A process of coating zinc surfaces which comprises immersing a zinc-surfaced material in an aqueous solution of a plurality of compounds which provide the substances, and the amounts of said substances, hereinafter described, said compounds being selected from the group consisting of salts and acids, the entire amount of one of said substances being provided by at least one salt, said solution consisting essentially of the following said substances dissolved therein in the following amounts:

	Grams per liter
CrO_3	48.1 to 288.5
SO_4	5 to 60
NO_3	2 to 40
$CH_3.COO$	Up to 80

said solution having a temperature from 60° to 130°F. and a pH between −0.3 and + 1.0, the immersion of the said material being continued until a bright, colorless transparent protective coating is imparted to the zinc surface, and removing the material from the solution.

Coating Thickness Tester

U. S. Patent 2,824,281. *Feb.* 18, 1958. *R. R. Radnor, assignor to General Electric Co.*

A gauge for measuring the thickness of a thin non-conducting coating applied over a conducting base and having a spot of conducting paint of predetermined size applied thereon to form with said conducting base an equivalent parallel plate capacitor.

Zipper Polisher

U. S. Patent 2,824,319. *Feb.* 25, 1958. *K. F. Nagele*

A machine for polishing slide fastening links mounted in sets on the beaded edge of a strip of indefinite length with vacant places unoccupied by links between the individual sets of links.

Corrosion Preventive

U. S. Patent 2,824,059. *Feb.* 18, 1958. *W. M. Chamot, assignor to National Aluminate Corp.*

A corrosion inhibitor composition consisting essentially of in proportions by weight about 8-12% of a water and oil dispersible corrosion inhibiting material, about 8-12% of an unoxidized mineral wax, about 3-12% of a high molecular weight solid polyalkylene glycol dispersant, and a major proportion of a weighting material, in solid stick form.

Strip Cleaning and Processing Machine

U. S. Patent 2,824,321. *Feb.* 25, 1958. *K. L. Bandy, assignor to The McKay Machine Co.*

A strip cleaning machine having a frame, a power driven brush roll, and means to journal said brush roll in said frame.

Paint Roller

U. S. Patent 2,824,325. *Feb.* 25, 1958. *M. H. Lussier.*

A paint-applying device comprising a container having end walls extending above the open top portion thereof, said end walls being downwardly slotted at their uppermost parts and being provided with interior grooves extending slantingly downward and a paint applying roller, the lower ends of the slots providing stops for the paint-applying roller.

Paint Roller

U. S. Patent 2,824,328. *Feb.* 25, 1958. *G. L. Bedford.*

A paint applying device, comprising a handle having a front end formed to provide a disk, said disk having a front face which extends from said handle at an angle.

Chromium-Vanadium Bath

U. S. Patent 2,824,829. *Feb.* 25, 1958. *M. F. Quaely, assignor to Westinghouse Electric Corp.*

In the process of electrodepositing an adherent highly heat-resistant black finish on a member, the step comprising making the member a cathode in an aqueous electroplating electrolyte comprising essentially from 150 to 385 grams per liter of chromic acid, from 1.8 to 10 grams per liter of vanadium in soluble compound form, there being present from 100 to 9.5 parts by weight of chromium per part of vanadium, and from 3 to 20 grams per liter of a water soluble carboxylic acid, and passing a plating electrical current through the member at a current density of from 400 to 2,000 amperes per square foot, the electrolyte being maintained at a temperature of from 30°C. to 50°C.

Superimposing A.C. on D.C.

U. S. Patent 2,824,830. *Feb.* 25, 1958. *J. K. Hausner.*

In a process for electroplating, connecting the electrode and the article to a direct current source through a pair of conductors, connecting to said conductors an alternating current source having a frequency such that said conductors form a transmission line of substantial electrical length as compared to one wavelength, determining the resonant and anti-resonant positions of said conductors by moving the high frequency connection points along said conductors, and obtaining a maximum high frequency field in the electrolyte by adjusting the high frequency connection points to resonant positions.

Strip Electrotinning

U. S. Patent 2,825,681. *March* 4, 1958. *S. S. Johnston, assignor to National Steel Corp.*

The method of eliminating striation and anode pattern in the progressive electrotinplating of a surface of ferrous metal strip at strip speeds of about 1000 feet per minute and higher, comprising the steps of progressively passing the strip at a speed of at least about 1000 feet per minute through a washing zone, a rinsing zone and an electrotinplating zone, washing the surface of the strip to be plated with relatively cold water in the washing zone, passing a stream of hot aqueous rinsing solution into the rinsing zone, heating the strip in the rinsing zone in the absence of electrolytic treatment of the strip to a temperature within the range 120° Fahrenheit to 160° Fahrenheit by continuously bringing the hot aqueous rinsing solution into intimate contact with the surface to be plated, and electrotinplating the surface of the heated strip in the electroplating zone while the surface to be plated is in contact with a bath of aqueous electrotinplating solution, the electrotinplating solution containing at least one tin electrolyte

and the rinsing solution containing said one tin electrolyte.

Plating on Titanium

U. S. Patent 2,285,682. *March* 4, 1958. *L. Missel and J. O. Powell, assignors to Menasco Mfg. Co.*

In a process for coating the surfaces of articles of titanium base alloys containing about 5% chromium and about 3% aluminum, the steps of cleaning the articles to be coated, immersing the articles in an acid etch bath, removing said articles and rinsing the same, immersing the articles in an aqueous solution of from about 0.01% to about 15% by weight of hydrofluoric acid, from about 0.1% by weight to the saturation point of a compound selected from the group consisting of chromic acid and water soluble salts of a chromium acid, and from about 0.01% by weight to the saturation point of a soluble salt of a heavy metal selected from the group consisting of copper, zinc, silver, cadmium and nickel for a period of about 60 seconds at a temperature corresponding approximately to the boiling point of said solution, to deposit said heavy metal upon the surfaces of said articles, removing said articles and rinsing the same, and electroplating said articles in a plating solution.

ABSTRACTS

Gold Leaf-Electrolytic Preparation Methods

W. Plate; *Deutsche Goldschmiedezeitung*, 55, No. 5/6, 249.

The normal preparation method for gold leaf is to melt the gold or gold alloy in a crucible; the melt is then cast into bars or into thin rods. The rods are then rolled down, by cold rolling with intermediate annealing, to a thickness of 0.03 mm. The ultimate limit for rolling down of gold, silver and platinum is about 0.02 mm. The foils are cut into small squares, these are placed between squares of parchment and hammered out. After the mechanical hammering, the final reduction is obtained by hand (gold beating). The metal then has a thickness of about 0.0001 mm., so thin that it is transparnet to short-wave light.

An advantage of the electrolytic production of gold leaf is that this laborious and lengthy hand processing is dispensed with. Also, it is not possible to produce gold leaf which is of perfectly uniform thickness by the gold-beating process. With the electrolytic process, the gold is deposited as a very thin coating on a bright metal belt which runs through the gold bath. This belt can consist, for example, of stainless steel. A celluloid or cellophane coating, or the solution of a similar synthetic resin is used as parting layer. The gold leaf prepared in this manner, can be marketed in rolls. The gold can also be deposited electrolytically on an auxiliary thicker coating, and can then be covered with a further metal coating. Both these auxiliary coatings finally can be dissolved away by chemical means, leaving the gold.

Chemical and Electrolytic Removal of Plated Coatings

M. Heilscher, *Deutsche Graveur und Stempel Zeitung*, **82**, No. 7, 108-110.

If suitable processes are available, preference is given to the non-electrolytic method for the removal of deposits. With varying coating thicknesses, it is often possible to prevent an attack on those areas of the basis metal which have been exposed at an earlier stage, by the addition of an inhibitor.

Electrolytic stripping methods are associated with considerable difficulties, in particular with recessed ware, as the coating is dissolved away faster at the places favorable to current density build-up, in spite of greater coating thicknesses, and an etch attack at these positions generally cannot be avoided. Dip stripping, however, cannot be employed with thicker metal coatings as the immersion times are too long.

The following procedures can be adopted for the removal of cadmium coatings on various basis metals.

ALUMINUM:

The cadmium is dissolved from the aluminum by dipping in concentrated nitric acid.

STEEL, COPPER AND BRASS:

1. The cadmium can be stripped electrolytically in a bath consisting of:

Sodium cyanide	100-200 g./l.
Sodium hydroxide	30 "
Current density	2-5 amp./dm.^{2}

2. The most commonly used bath is made up from hydrochloric acid in various concentrations, with or without the addition of an inhibitor,

Hydrochloric acid	1 liter
Antimony trioxide	15 g.
Water	100 cc.

This bath works at room temperature and, in the case of steel, prevents an attack on the basis metal by the precipitation of a black antimony film, which can be removed by anodic treatment in an alkaline cleaner.

STEEL:

Rapid anodic stripping is obtained with a solution of:

Sodium nitrate	150-200 g./l.
Current density	3-5 amp./dm.^{2}

The following procedures can be adopted for the stripping of lead coatings.

COPPER, BRASS, NICKEL AND STEEL:

The lead coating can be dissolved away chemically in a solution of:

Glacial acetic acid	330 cc.
Hydrogen peroxide	50 "
Water	1 liter

If it is desired to obtain shorter stripping times, the hydrogen peroxide concentration should be as high as possible (20-30%).

STAINLESS STEEL:

Lead coatings can be stripped from stainless steel by immersion with:

Nitric acid	20 % vol.
Temperature	65°C.

Concentrated nitric or hydrochloric acid is recommended for the removal of palladium coatings, on those basis metals which these strong acids do not attack. Nitric acid is preferable for use with the basis metals gold and platinum, and cold, concentrated hydrochloric acid for removal from most of the other basis metals.

With silver as the basis metal, palladium can be stripped anodically in an aqueous solution of:

Sodium chloride	112.5 g./l.
Hydrochloric acid	4 "

Mechanism of the Electrodeposition of Chromium

A. Pamfilow, and A. I. Lopuschanskaja: *Ukrain chim. Zurnal* (Ukraine Chemical Journal — Russia), 22, No. 5, 578.

The authors conducted research on the still disputed question of the atagewise reduction CrO_3 to chromium metal, attempting to clarify this matter by means of polarographic research.

A saturated calomel electrode served as a comparison cell; a similar arrangement as drop capillary, of given characteristics and a galvanometer of definite sensitivity was used as the measuring instrument.

With a concentration of the CrO_3 of 1.0×10^{-3} mol. and 0.1 N. KCl, the polarogram gives an I-E curve with three polarization stages. The potentials of the half waves of the second and third stages are located respectively at voltages of —0.95 V. and —1.73V. Obviously, the first stage is caused by the reduction of $Cr^{3+} + e \rightarrow Cr^{2+}$ and the second stage by $Cr^{3+} + 3\,e \rightarrow Cr$. The theories which are in existence at the moment concerning the cathodic separation of chromium metal still require experimental confirmation.

Phenomena Occurring During Electrolytic Reduction of Aqueous Sulfate-Containing Chromic Acid Solutions

M. Frey; *Metallwarenind. und Galvanotechnik,* 48, No. 9, 63.

The processes which occur during cathodic reduction of importance to chromium plating practice, and the preparation of pure chromium metal, were investigated by the author. As has already been established by the earlier investigations, with the use of a pure chromic acid solution for electrolysis, under the effect of the current flow the cathode immediately becomes covered with insoluble chromic chromate, so that metallic chromium can only be deposited at very high current densities, in a spongy form and with poor current efficiency. The reduction procedure proceeds in a considerably different manner when the addition of small amounts of foreign anions is made to the bath such as $SO_4^{=}$, Cl^{-}, F^{-}, $SiF_6^{=}$, BF^{-}. It is then possible under suitable operating conditions, to achieve good, chromium deposition.

It was found in this research that the sulfate ions which are added to the chromic acid in the bath are gradually changed by the current at the cathode into a soluble complex compound, which can be detected analytically in the bath and which is not precipitated by the addition of barium chloride at room temperature. In this complex there are contained linked trivalent chromium and sulfate ions in the ratio of 2:1.

The foreign ion effect in the bath is associated only with the free sulfate ions and not with the linked ones, so that a sulfate-containing, chromic acid solution, separated from the anode by a diaphragm, gradually becomes ineffective during electrolysis as a result of a too low concentration of free sulfate. Without a diaphragm, the sulfate-complex compound which is formed at the cathode is again destroyed at the anode so that, other things being equal, the cathodic chromium deposition can take place for an unlimited period of time.

In order to provide an explanation for the phenomena occurring with reduction, amplification was made of the former work of Essin and Biruekoff. Tests were conducted under the conditions normal to chromium deposition. The amounts of chromium metal, trivalent chromium, hydrogen, and combined sulfate formed at various times, were ascertained.

As was established by the curves obtained in this manner, the free sulfate concentration falls sharply with time at constant current density. The current yields in metallic chromium and Cr^{3+} likewise fall off, while the current yield in hydrogen correspondingly increases. From these series, as well as from further electrolyses, in which the starting solutions had a varying sulfate content, it was possible to ascertain the current yields in metallic chromium in relation to the sulfate content.

The results of these tests confirmed the results obtained by previous workers (Haring, Barrow and Biruekoff). This is, that the yield of metallic chromium is at a maximum with a sulfate content of about 1%. The current yield in chromium metal decreases with a rising sulfate content with sulfate concentrations above 1%, about as much as that of Cr^{3+} increases. By determination of the combined sulfate in these tests, with the aid of the ratios mentioned of combined Cr^{3+} to combined sulfate in the complex, the free and the combined Cr^{3+} could be calculated. It was shown that, with increasing sulfate, the combined Cr^{3+} increases linearly with the free Cr^{3+}.

Cold Chromium Plating of Dies with a Large Surface Area

M. E. Goldstein: *Stanki i Instrument* (Russia), **28**, No. 4, 34.

In machine construction, it is often necessary to chromium plate parts with a large surface area. As plating of such large surface areas of this type, naturally, is associated with very high current densities, high current sources must be available.

In order to be able to work with smaller current sources in an emergency, the process of partial chromium plating is applied. This implies that plating is conducted in portions or with a movable anode. Apart from the usual disadvantage of an emergency measure, defects usually occur in the deposit, which are difficult to overcome, so that it is only in real cases of need that such measures are employed.

In a machine construction factory in Russia, tests were conducted with the objective of successfully plating large surface areas even at low current densities. An example is given of the chromium plating of a machine tool part with a surface area of 2.5 sq. meters. Details are given of the bath composition employed, the racking arrangements, the current leads and the operating data of the process.

Science for the Coatings Technologist

(*Continued from page* 66)

as the acid portion of the drier soap. Their principal advantage is that they are cheap. Tall oil is a by-product of paper manufacturing, and is the least expensive of the common oils. It contains a very high percentage of rosin. This is an advantage for its use in the manufacture of driers. The rosin acid contributes increased solubility and stability to the soap (over ordinary oil acids).

However, tallate driers are much lower in stability than are either naphthenates or octoates. Even though they are stabilized, they show sludging and hazing frequently in the undiluted state upon aging. This is equally true for the diluted form, or sometimes even more so. In varnishes and alkyds the hazing and sludging are not as marked as might be expected, but the tallates show definitely lower stability than do the naphthenates or the octoates. However, where the end-use is properly selected, they can be used without trouble.

The color of tallate driers is much more pronounced than that of either naphthenates or octoates. This shows up as increased staining of whites and discoloration of clears. Again, this drawback need not preclude the use of this type of drier in all formulations.

(*To be continued*)

Recent Developments

NEW METHODS, MATERIALS AND EQUIPMENT FOR THE METAL FINISHING INDUSTRIES

Vinyl Finish Applied in Dry Powder Form

National Polymer Products, Inc., Dept. MF, 125 North Fourth St., Reading, Penn.

Vinyl powders are now available for a new method to coat metals. The new powdered resins, named Corvel vinyl fusion bond finishes, are specially processed for use in the Whirlclad process, a fluidized finishing process available under license from the above company.

Metal parts to be clad are preheated to a temperature above the flow point of the vinyl resin and dipped into a bed of dry fluidized vinyl powders which encapsulate the object and bond by fusion onto the metal surface. Uniform cladding thicknesses of from 10 to 50 mils are obtained in a single dip.

Since the vinyl finishes do not incorporate a solvent, they provide a surface free of drips, sags or pock marks encountered when using conventional coating solutions. Heat fusion holds the finish on edges, corners and projections. On wire products, the cladding holds to joints and intersections with a minimum tendency to bridge across gaps.

De-Smutter for Aluminum

Northwest Chem. Co., Dept. MF, 9310 Roselawn, Detroit 4, Mich.

Alkalume D.S. is a new, thoroughly field-tested chemical product, specially prepared for de-smutting aluminum. This new product, designed to replace dangerous liquid acids, has a longer life than sulphuric-chromic and produces a bath that cannot be achieved with liquid products. De-smutting time is equivalent to that of liquid acids, approximately one-half of etching time.

The new de-smutter is dry, dustless, and free-flowing. Guess work when using combination acids is entirely eliminated. Available in 500 lb. drums and 150 lb. kegs, the product is both easier and safer to handle than the standard carboy-contained acids. When adding to water or bath, no heat reaction is produced and no special equipment is needed.

Rubber Repair Kit

Automotive Rubber Co., Inc., Dept. MF, 12550 Beech Road, Detroit 39, Mich.

The new "ARco Rubber Repair Kit" for repairing tanks, vessels, fittings, and other rubber lined or covered equipment, makes it possible for on-

the-job maintenance and repairs on rubber lined or covered equipment by shop personnel. Simple and complete application instructions plus all the necessary tools and materials are compactly contained in this durable, self-storing kit.

Sheet rubber AR-814 furnished in kit (10½ sq. ft.), manufactured in the firm's own rubber mills, is specially compounded to resist all solutions normally contained in rubber-lined equipment. The sheet rubber is $\frac{3}{16}$" thick, spark-tested to insure freedom of voids, and is guaranteed leak-proof.

The complete kit is marketed to sell for $75.00 F.O.B. (Detroit), shipping weight 25 pounds. Special Neoprene repair kits are also available on request.

Flux Remover and Pickle

Bernard Chem. Prod. Co., Dept. MF, 98-21 Linden Blvd., Ozone Park 17, N. Y.

A recently developed product, Bernite 45, is claimed to effectively and rapidly solve all flux removal problems. It is very effective in removing flux residues as a result of brazing and silver or gold soldering. The product will dissolve them in a matter of minutes and pickle the metal as well.

It is supplied in powder form, using a concentration of 10 to 12 ounces per gallon of hot water. Its use eliminates hazards, spillage, and toxicity factors which are frequently found with the use of acids. Samples on request.

Barrel Finishing Media

Dixon Sintaloy Inc., Dept. MF, 535 Hope St., Stamford, Conn.

Produced by a unique sintering process on which patents are pending, the new media can be manufactured economically in mass quantities in the most suitable shapes to meet various specific tumbling and barrel finishing needs. In addition to absolute uniformity, the sintering method permits precise control of material hardness, shape, porosity, and surface characteristics to provide media with the most desirable properties for particular applications. Use of sintered material also permits impregnation of the media with auxiliary cutting, polishing or finishing compounds as well as heat treating.

Offered under the registered trade names of Sintabur, Sintabrite, Sintahone, Sintacut and Sintacote, these new tumbling materials are claimed to ex-

Harshaw Announces *Another Addition*
to its growing family of Bright Nickel Plating Processes

HARSHAW

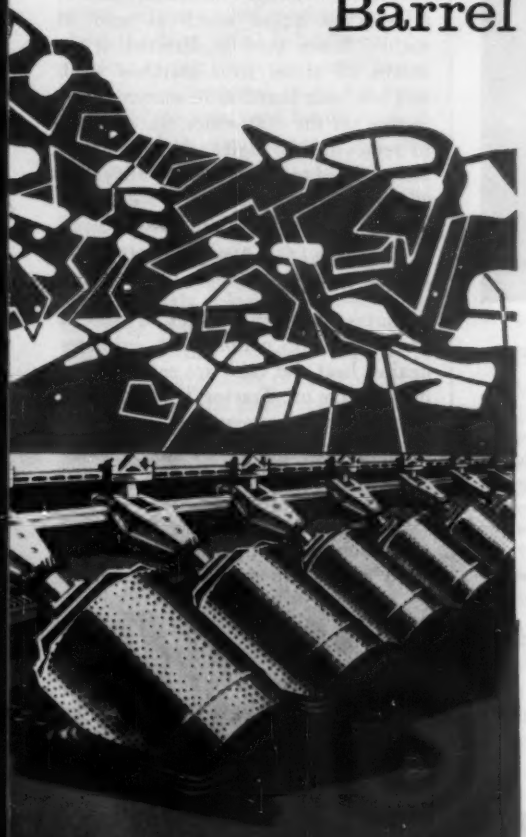
Harshaw

Super NIBRITE

Barrel Bright Nickel Process

The Harshaw Chemical Company has developed the SUPER NIBRITE BARREL BRIGHT NICKEL PROCESS to produce a lustrous and ductile nickel deposit by the use of only two brighteners, both of which are liquid addition agents. These addition agents are non-metallic, organic type brighteners designated as BBN #1 (the primary brightener) and BBN #2 (the secondary brightener).

Among the many advantages of the SUPER NIBRITE BARREL NICKEL are its superior brightness, excellent leveling, ductility, ease of operation and control, tolerance to organic and metallic impurities, and its receptiveness to chrome plating.



Brightness. The SUPER NIBRITE nickel plate is bright over a wide range of current densities and temperatures.

Leveling and Ductility. For a barrel nickel the SUPER NIBRITE nickel plate has amazing leveling and ductility over its entire operating range.

Ease of Operation and Control. The recommended operating conditions for SUPER NIBRITE nickel are a pH of 4.0-5.0 and a temperature of wide range up to 140°F. The BBN #1 concentration can be high without any ill effect on the operation of the bath and since it is lost mainly only through drag-out, additions can be made in proportion to the nickel salts added to replace drag-out losses. The amount of BBN #2 used in any specific installation varies with the type of work, finish of the base metal, and the required finish. Additions can be made with ease prior to the end of plating time.

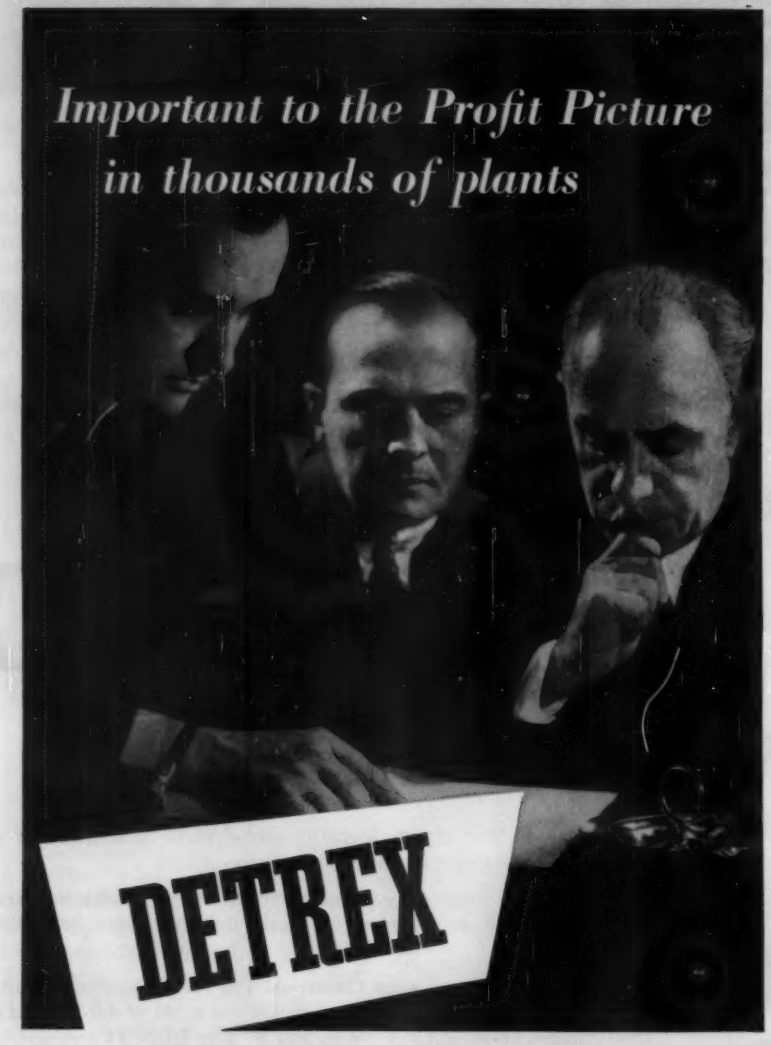
Tolerance to Impurities. SUPER NIBRITE solutions remain ductile and bright over long periods of operation due to the high tolerance of the solution to both organic and metallic impurities. There are no unusual breakdown products from the organic brighteners themselves and thus any measures taken to avoid severe contamination will result in trouble-free operation. Also carbon treatments and filtrations, if necessary, can be performed without undue loss of the brighteners.

Extended Periods of Idleness. SUPER NIBRITE baths can be operated after extended periods of idleness without sacrificing loss of brightness or ductility.

Speed. The greater conductivity and faster plating rates obtained by operating the solution at 140°F can be used to great advantage by reducing the plating time for a desired finish up to 50%.

Contact the Harshaw Branch nearest you. Harshaw representatives will be happy to discuss with you the application of this process in your plant.

The Harshaw Chemical Co.
1945 East 97th Street • Cleveland 6, Ohio
CHICAGO • CINCINNATI • CLEVELAND • DETROIT • HOUSTON • LOS ANGELES
HARTWICK-ON-HUDSON, N. Y. • PHILADELPHIA • PITTSBURGH



• Alkalies • Emulsions
• Phosphate Coatings

From DETREX's full line of alkali and emulsion cleaners you may choose the one that has the precise qualities your operation demands. Whether you need solvency, stability, safety, corrosion resistance or straight cleaning for any metal cleaning operation, a DETREX alkali or emulsion product will fit the need.

DETREX phosphate coatings for paint bonding, rust proofing, cold extrusion and many other finishing processes are reducing costs and increasing quality for thousands of such operations.

DETREX expert technicians and field service men stand ready to help you now. **Write today for full details.**

Depend on DETREX for Every Metal Cleaning and Processing Need

Alkali and Emulsion Cleaners
Phosphate Coatings and Paint Bond Compounds
Rust Proofing Oils and Compounds
PERM-A-CLOR NA* (Degreasing Solvent)
Solvent Degreasers
Ultrasonic Equipment
Industrial Washers
Extrusion and Drawing Compounds
Spray Booth Compounds
Aluminum Finishing Compounds

*PERM-A-CLOR NA is the registered trademark of

DETREX CHEMICAL INDUSTRIES, INC.

BOX 501, DEPT. MF-9, DETROIT 32, MICHIGAN

hibit up to ten times the useful life of conventional materials.

Because ideal shapes are available for a particular part finishing job and because the media does not powder or break down in use, clogging, packing and jamming as well as loading and discoloring of parts is greatly minimized. For these same reasons, the new materials can be used dry without the usual tumbling solutions and, frequently, the cleaning stages following tumbling can also be eliminated.

Currently available standard shapes include triangles, discs and spurs in a full range of sizes, in heat-treated steel and brass alloys and suitable for use on a wide variety of part materials.

Stainless Steel Welding Stain Remover

Chemclean Products Corp., Dept. MF, 15-08 121*st St., College Point* 56, *L. I., N. Y.*

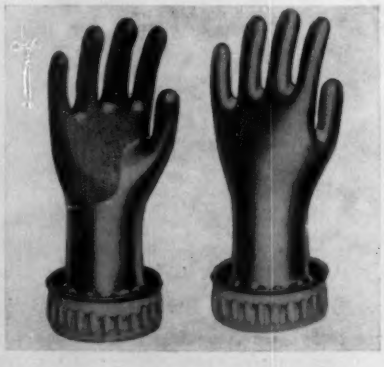
A new development for the removal of burns and stains on stainless steel caused by welding, Chemclean #536 is a colorless liquid which is acid in nature. When used as directed, it removes all stains from stainless steel, and has been found to be extremely effective on the 300 series. In addition to removing the stains, the product is also claimed to brighten these alloys.

Lined Neoprene Gloves

Surety Rubber Co., Dept. MF, Carrollton, Ohio.

Gloves lined with Softex, a smooth hand relaxing cotton that insulates against heat and cold, are easier to put on and take off. Tractor Tread Griptite fingers and palms assure positive gripping action of wet, slippery materials without sacrificing sensitivity.

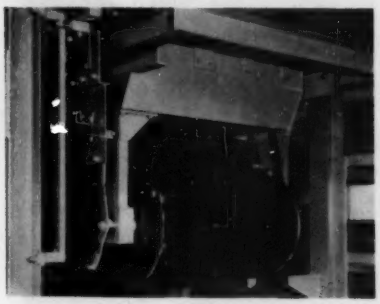
Available in both gauntlet and the exclusive turn-cuff styles, for added protection against liquids, the new lined gloves are produced in a com-



plete size range — small (7-7½), medium (8-8½), large (9), and extra large (10-10½).

Automated Processing Barrel

Hanson-Van Winkle-Munning Co., Dept. MF, Matawan, N. J.



What is believed to be the first horizontal barrel door that opens and closes fully automatically is a feature of a new metal processing barrel, designed for cleaning, phosphating, blackening, chromate treatments, pickling, and similar processing. After the barrel is loaded, a signal starts it rotating. Rotation actuates the mechanism that closes the door, which is held secure by a detent spring while the barrel passes through the treatment cycle. On completion of the treatment, barrel rotation is reversed to open the door and discharge the load.

Because of its automatic features, the barrel lends itself to integration into automated processes. For instance, it is adaptable to automatic hopper feeding and automatic unloading to hoppers or conveyor belts. The manufacturer claims that this barrel is capable of handling heavy loads of large or small parts. Its size and configuration can be tailored to individual requirements. Barrels may be chain, belt, or gear driven.

Bright Copper Process

R. O. Hull & Co., Inc., Dept. MF, 1300 Parsons Court, Rocky River 16, Ohio.

According to the manufacturer, the new Ro-Bright cyanide copper plating process produces extremely wide bright plating range through current densities up to 80 amp./ft.^{2}, with good results obtainable with either direct, interrupted, or periodic reverse current. Outstanding uniformity between high and low current density areas permits shorter plating time and eliminates excessive build-up on high current den-

Stokes Vacuum Coater cuts finishing costs

New England Metallizing Co., Pawtucket, R. I., uses a Stokes Model 437 Vacuum Metallizer for the production of trophies, costume jewelry and other products. Michael Corso, Jr., President, says—"Because of the ease of operation, ease of maintenance, and speedy pumpdown, we would recommend the Stokes Metallizer to anyone in the metallizing field." Its design enables easy cleaning—its big capacity gives maximum production.

Stokes vacuum metallizing imparts a distinctive gold, brass, copper or chrome finish at attractively lower costs than electroplating . . . makes it possible to offer smart, modern products at low, competitive prices. It enables plating non-conductive materials—provides bright lasting finishes that will withstand weather and other abusive environments.

Interlocked centralized controls on the Stokes systems make it easy to learn operating procedures and routine—to meet consistently high standards with minimum labor. The equipment is compact and self-contained . . . requires little floor space.

Stokes can give you practical help in over-all planning . . . to determine plant layout, production techniques, rates, and costs . . . to select materials and auxiliary equipment . . . to train operators. Contact your nearest Stokes office, or write for data on Stokes Vacuum Metallizing equipment.

Vacuum Equipment Division
F. J. STOKES CORPORATION
5500 Tabor Road, Philadelphia 20, Pa.

STOKES

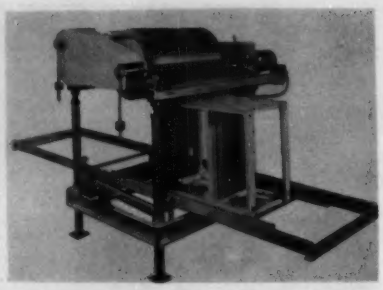
sity areas to achieve minimum thickness of deposit in recesses, thus saving time and metal. It may be used with potassium, sodium, or mixed formulation to produce semi-bright or full-bright copper, as desired. It may be used with or without rochelle salts with equal effectiveness. There are three addition agents: a wetting agent, a primary brightener, and a secondary brightener to cover all applications for semi-bright to full-bright deposition, and are easily controlled by the Hull Cell test.

Because of reasonably and identically priced addition agents, the operating cost is low. Quantity discounts apply to total gallons ordered in any combination of addition agents. The new process is now available through nationwide stockpoints. Samples of plating baths are requested for conversion recommendations.

Wood Grain Printer

M-H Standard Corp., Dept. MF, 515 *Communipaw Ave., Jersey City* 4, *N. J.*

A wood-grain printer of an advanced design has been engineered to eliminate major existing production difficulties



in grain printing. Known as the Morrison Printer, it is a conveyorized, self-feeding machine which does not require specialized skill on the part of the operator; and will print assembled cases and cabinets, furniture parts, table tops, two sided doors and lids, edges, etc., without or with a minimum of jig work.

Engraved cylinders are quickly changed simply by lifting without requiring disassembly of chains or gears. Extra service life and superior print clarity and brilliance are achieved by using an extra large (18" dia.) application cylinder and by eliminating the use of gelatin. The specially developed, durable plastic composition printing surface is almost completely unaffected by ambient temperature and humidity changes thus eliminating the need for air-conditioning.

In addition to this standard model designed for a typical cabinet or furniture plant, other models are being engineered for special applications in multi-color, tandem or parallel operation; for items of unusual size or shape and for special production requirements.

Spring-Clamp Cathode Hook

Belke Mfg. Co., Dept. MF, 946 *N. Cicero Ave., Chicago* 51, *Ill.*

Positive contact pressure between the cathode rod and cathode hook, so necessary for effective chrome plating, is

assured by a new spring-clamp cathode hook. Because of the full current flow between the hook and cathode rod, rejects and partial platings, which are common with gravity cathode contacts, are avoided. The spring-clamp hook also keeps the racks from creeping or sliding together when a rod agitator is used.

Squeezing the spring-clamp lever opens the hook to receive the cathode rod. Releasing the lever locks the hook in place. To equip racks with spring-clamp hooks the present cathode hooks are cut off and the clamp hooks are bolted on.

The hooks are available for any size of rack spine and for 1", 1¼", 1½", and 2" cathode rods.

Barrel Finishing Machine

Globe Div., Casalbi Co., Dept. MF, 540 *Wayne St., Jackson, Mich.*

Model 30-34 HPT is a heavy duty finishing machine for grinding, deburring, and burnishing. The parts are loaded while the barrel is tilted 40 degrees above horizontal. The parts can be finished in a tilted postion, but betbetter action is obtained in the horizontal position, according to the manufac-

STUTZ BALL ANODE CONTAINER

NEW CONSTRUCTION
For LONGER SERVICE . .
STUTZ CONSTRUCTION

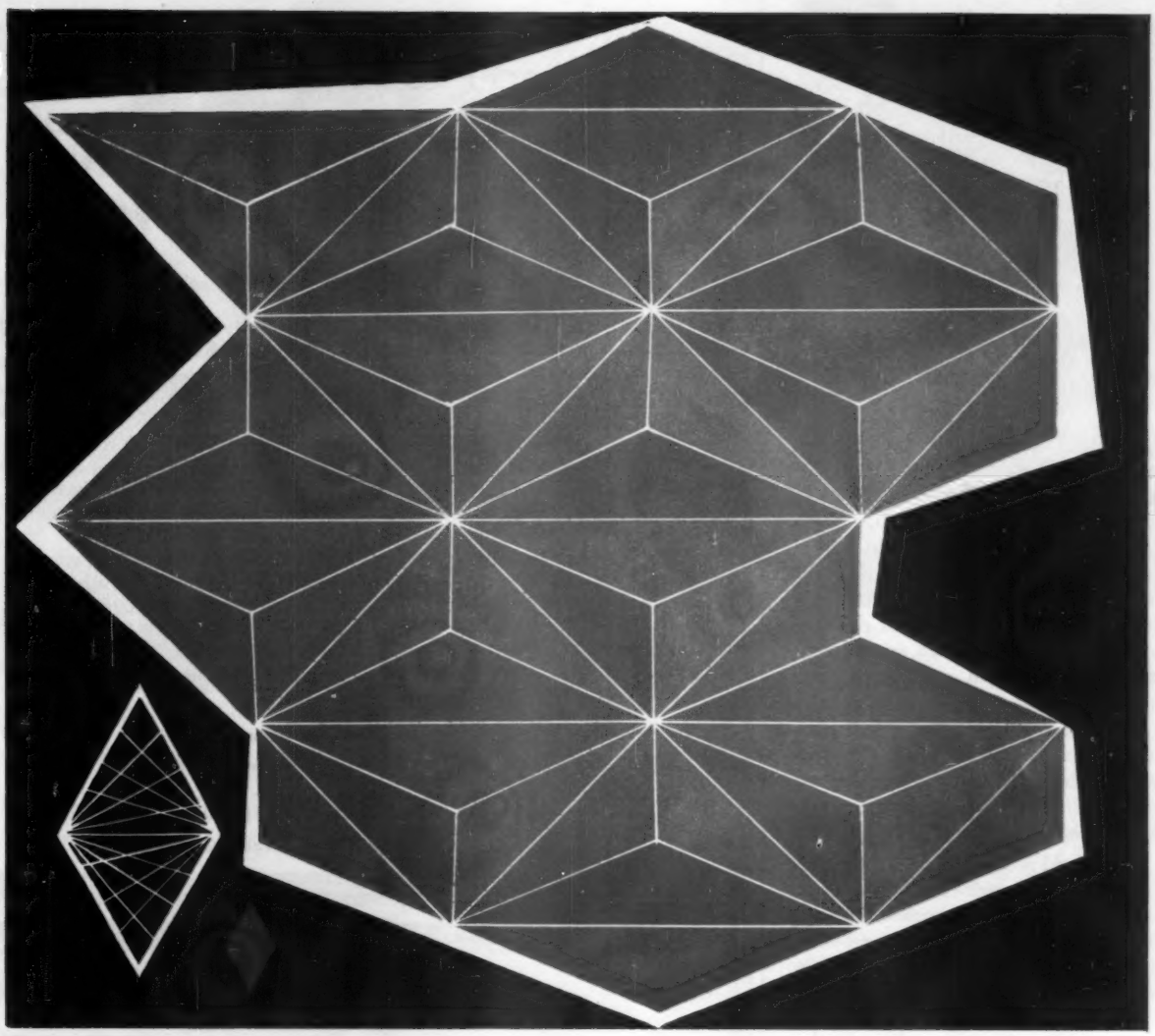
Heavy gauge steel with wire woven through steel angle firmly attached to main stem. Cannot come apart or loosen. Side clip is for STUTZ BARREL PLATING TANKS having submerged rectangular anode bars. Side clip not furnished for racked plating tanks. Standard hook 6 inches. Other hook lengths furnished in quantity of 100 or more.

WELDED CONSTRUCTION — Note how welds have dissolved or broken in use. Often caused in barrel plating where currents are high and barrel transfer is rapid.

Write for Complete Catalog

PRICES—11 cents per inch for basket lengths 18 inches or longer. Increments 3 inches. Curved containers one size only, 27" for 14" and 16" diameter barrels 15¢ per basket additional.

The STUTZ Company
Complete Metal Finishing Equipment & Supplies
4430 Carroll Ave. • Chicago 24, Illinois



NEW!

SANDOFIX ALU..

SANDOZ

The first and only non-smutting sealer for anodized aluminum

New! Sandofix ALU reduces operating costs by eliminating post-sealing buffing or coloring.

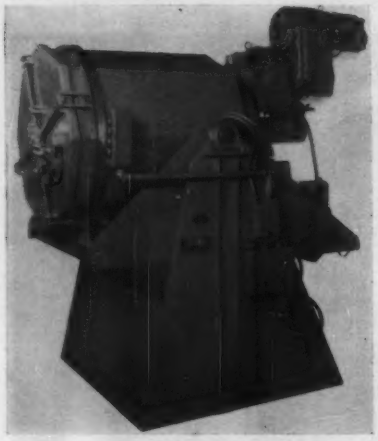
New! Sandofix ALU improves the appearance of those products that are impossible to buff because of their shape.

New! Sandofix ALU eliminates the need for pH control of the sealing bath under normal operating conditions.

Even black dyed anodized aluminum is completely sealed by a ten-minute immersion in Sandofix ALU solution *without any appearance of smut!*

Phone or write for the whole story. You'll be glad you did!

SANDOZ, INC., 61-63 VAN DAM STREET, NEW YORK 13, N. Y. ALGONQUIN 5-1700



turer. With the small hand inspection door, parts can be inspected without taking off the large aluminum door.

One of the unique features of the machine is the thorough rinsing of parts after grinding and before burnishing. The barrel is rotated while flushing. This flushing action, it is claimed, can not be accomplished in the conventional horizontal closed type machine.

Another feature is the self-aligning method of the barrel, in both the vertical and horizontal direction. This assures the front steel tire bearings taking a proportionate share of the load.

Total load is 1500 to 2000 lbs. Typical parts are the self-tumbling variety, which can be finished without the aid of separate media. Abrasive compound and water is used for grinding, then burnishing compound and water for burnishing. The barrel can be operated dry as well as wet, according to the manufacturer.

Cuneo Press finds "Plus-4" Copper Anodes keep working until they're "so thin that they almost float"

In the big, busy rotogravure cylinder plating room of The Cuneo Press, Inc., Chicago, the acid-copper tanks are operating 24 hours a day.

Supplying precision cylinders to meet weekly deadlines in printing some 13 million copies of weekly magazines and pictorial sections for newspapers calls for maximum reliability and efficiency in every phase of the operation.

Late in 1954, Cuneo first tried "Plus-4" Anodes, Anaconda's phosphorized copper anodes. After more than three years of experience, they report the following advantages:

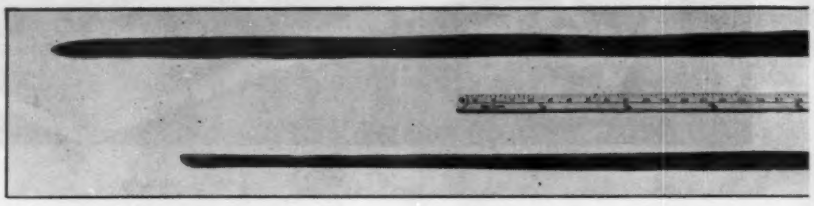
1. Solution is more easily maintained and balanced—with considerable saving in solution dumped and acid added.
2. Practically no sludge—tanks are drained only half as often as with ordinary anodes.
3. 15 per cent more usable copper. "Plus-4's" corrode so evenly (see below) that only slender ribbons remain. Though these do not actually float, they become so light that they no longer maintain proper contact with the anode cradle.

Write for information on how you can obtain a test quantity to supply one tank. Address: The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont. 58137

ANACONDA®

"PLUS-4"® ANODES Phosphorized Copper

MADE BY THE AMERICAN BRASS COMPANY

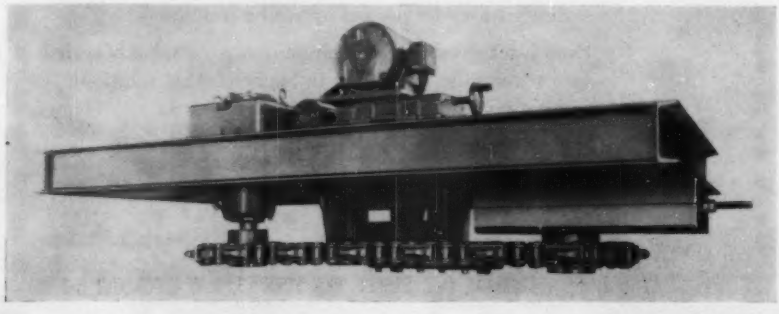


Conveyor Drive

The Alvey-Ferguson Co., Dept. MF, 2849 Disney St., Cincinnati 9, Ohio.

Featuring compact construction with greatly reduced headroom requirements, a new type variable speed caterpillar drive is now available for the above manufacturer's overhead trolley conveyors. Mounting the drive sprocket directly on the slow speed shaft of the vertical-type reducer has eliminated the bulky spur gear and pinion which were formerly used.

The new drive has been engineered in various combinations of horsepowers and speeds to meet the differing requirements of each trolley conveyor. Floating drives are furnished for installations where multiple drives are required. Fluid drives are provided for high inertia loads, as well as automatic overload cut-offs.



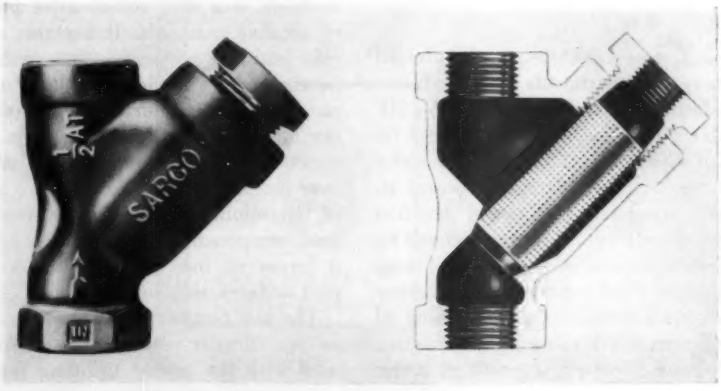
Self-Cleaning Pipeline Strainer

Sarco Co., Inc., Dept. MF, 635 Madison Ave., New York, N. Y.

Features of a new line of self-cleaning pipeline strainers in sizes from ¼" through 3", type AT, are the high strength construction of the semi-steel (ASTM-A48-48, class 30) bodies, internal design that insures tight fit of the screen cylinder without buckling, per-

Putting finishing touches on a copper cylinder for one of the weekly newspaper rotogravure sections shown in the background. *Below:* Typical "fish" from Cuneo's tanks. The top one is 80" long, weighs 2 lb. 3 oz.—original 85-lb. anode was 1" x 3" x 88½". Lower "fish" is 71" long, weighs 1 lb. 4 oz.—original 74-lb. anode was 1" x 3" x 76".

forated heavy gauge screen with spot welded lap seams that insure maximum rigidity with smooth inner surfaces, and built-in sediment collection chamber integral with cap. The 45° design facilitates clearing by blow-off. Every strainer is hydrostatically tested and is rated for saturated steam or liquid to 250 psi and 475°F total temperature.



Ultrasonic Cleaner

Blackstone Corp., Dept. MF, Jamestown, N. Y.

The unit illustrated has two 10" x 14" x 10" deep stainless steel tanks for ultrasonic cleaning and ultrasonic rinsing. The solution in each tank is continuously circulated and filtered to remove all particles of 2-5 micron size or larger. Each tank is activated by multi-element magnetostrictive transducers operating at approximately 20 Kc/sec.

The same basic unit is available with either single or multiple tanks which fit into the 25" x 25" stainless steel cabinet top.

Decorative One-Coat Organic Finish

Permatron Co., Dept. MF, 2117 E. York St., Philadelphia 25, Pa.

A new decorative, highly durable, one-coat organic finish is claimed to replace plating and electrochemical coloring methods on metals. Permatron finish is available in brass, gold, copper, bronze and in a variety of colors. Where it is used to simulate a metal, the finished product is virtually indistinguishable from the metal being duplicated, and has the added advantage of being non-tarnishing and requiring no maintenance, it is stated.

The finish is easily and efficiently applied since it requires no pre-treatment of metal. It can be sprayed, dipped or roller coated. After the finish is applied to any chemically clean, polished metal it is baked at temperatures between 400°F. for seven minutes and 325°F. for 15 minutes.

TYGON IS TOPS

For Lining Tanks

Here's why . . . **Here's how.**

TYGON's outstanding resistance to acids and alkalies permits its use in all the usual lining and covering jobs.

TYGON's unique resistance to oxidizing acids, oils, greases, and solvents makes possible its use in jobs other linings cannot handle.

TYGON's flexibility permits close conformance, resulting in a good bond, to all but the most intricately shaped equipment.

TYGON's resilience minimizes the possibility of damage from mechanical abuse.

TYGON's elasticity permits thermal contraction and expansion without rupture.

TYGON's abrasion resistance withstands the wearing action of thick slurries and dry or moist chemicals.

TYGON's negligible extractibility prevents contamination of the most sensitive solutions.

TYGON's availability in white (compound TL-104), as well as standard black, permits its use where solution visibility is highly important.

TYGON's high electrical resistivity prevents current losses in electrolytic action.

TYGON's smooth, non-porous surface makes for easier cleaning and greater solution flow.

TYGON's thermoplasticity permits the "heat-sealing" of seams to form continuous, one-piece, impermeable linings.

TYGON's selective solvent sensitivity eliminates the "need" for curing to obtain a strong bond—makes possible installations of virtually any size—simplifies field repairs.

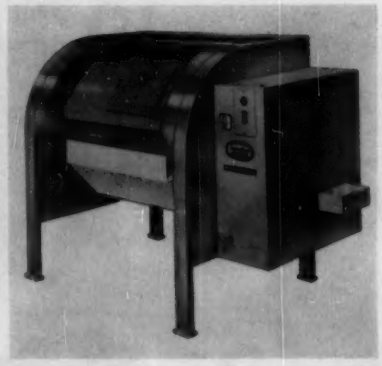
TYGON's non-oxidizing characteristics give it a long service life.

Write, right now, for more information! Ask for our new 12-page booklet on TYGON LININGS — Bulletin TL-526. It's packed with facts and figures.

U. S. STONEWARE

AKRON 9, OHIO

319-1 **Process Equipment Division**



the barrel for dumping finished parts directly into pans.

Barrels are available with either ¼" or ½" Neoprene lining, or unlined. The barrel itself is welded of heavy gauge cold rolled prime steel, rigidly gusseted, with extra rigidity assured by "A" frame plus box frame construction. All frame and supporting beams are of heavy "U" channel.

Other exclusive features of the new unit include a roll-away perforated hood, a cam-operated door, and self-aligning bearings with Zerk fittings and expanding dirt-seal rings.

Optional equipment available includes a drain door to permit fast drainage of water from the work-load, an unloading boot, and single and dual timer controls to provide automatic delayed starting and automatic stopping for accurately controlled running cycles.

Overall dimensions are: length, 69¼"; width, 41½"; and height 53". Shipping weight is 1,900 lbs.

Neutralizer Compound

Roto-Finish Co., Dept. MF, Kalamazoo, Mich.

A new neutralizer compound, developed to eliminate rusting and tarnishing of steel parts which often result from present barrel finishing methods, is a dry, non-abrasive blend of alkaline materials. It contains specific anti-rust properties that neutralize the effects of acid compounds used on metal surfaces during barrel finishing for removal of heat-treat scale. Its action prevents rusting or tarnishing over extended periods as long as a film of the solution is left on the iron or steel components. Completely soluble, it leaves no insoluble residue on the part surfaces, slots, or recesses.

The new compound, 117-C, also acts as an effective deburring aid when used with the proper grinding media

Barrel Finishing Machine

Almco, Queen Products, Inc., Dept. MF, Albert Lea, Minn.

Designed with the advantages of higher priced machines at a budget price, a new Economy Series barrel finishing machine designated the Supersheen Model EB-3032, has a 30" diameter x 32" long barrel for high volume finishing of small parts as well as fast action on large castings and forgings. Total barrel capacity of 13.8 cubic feet or 1,000 lbs. can be divided into two compartments if desired.

The barrel is driven by a 1½ HP motor through a helical gear speed reducer which gives 97% efficiency under full load. A variable speed control allows adjustment of barrel rotation speed from 10 to 30 rpm as dictated by individual operations. A positive magnetic brake and forwarding and reversing switch permit easy positioning of the barrel for loading and unloading. Adequate clearance is provided under

Spread Eagle Bookends

by Virginia Metalcrafters

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finished with

Lea compound

These heirloom gifts are hand cast in solid brass and hand finished using Lea Compound. Virginia Metalcrafters of Waynesboro are famous for their colonial reproductions in Brass, Iron, Pewter and Tin. For the high grade finish such reproductions demand, they come to Lea of Waterbury.

For hand finishing or automatic finishing; for colonial or modern designs, for brass, aluminum, steel, bronze, silver or plated parts, there is a Lea Compound and a Lea Method which will give you real production economy. Write or telephone us today about your finishing requirements.

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THE LEA MANUFACTURING CO.

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Lea-Michigan, Inc., 14066 Stansbury Ave., Detroit 27, Mich.
Lea Mfg. Company of Canada, Ltd., 1236 Birchmount Road Scarborough, Ontario, Canada
Lea Mfg. Company of England, Ltd., Buxton, England
Lea-Ronal, Inc., Main Office and Laboratory: 139-20 109th Ave., Jamaica 35, N. Y.
Manufacturing Plant: 237 East Aurora St., Waterbury 20, Conn.

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An undercoat of silver by the Lea-Ronal Bright Silver Process aids corrosion protection to thin gold deposits subsequently plated . . . a combination particularly useful in the electronics parts field.

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One Simple Process designed for two major "industries"

For Decorative Plating—The Lea-Ronal Silver-Glo process economically produces bright to brilliant deposits that add that all important "look" . . . that buying appeal to a finished article.

For Industrial Plating—The Silver-Glo Process produces bright deposits with greater wear resistance than conventional silver. Silver-Glo deposits are being used over copper and copper alloys as an undercoat for thin gold deposits to increase salt spray resistance.

Silver-Glo Process Offers You

- Crystal clear solution; operations are visible at all times
- Excellent throwing power
- Bright, ductile deposits
- Stable solution: No brightener breakdown
- High current density operation range
- Same solution can be used for still or barrel operation

If you are seeking the consistently superior results combined with economy that are being obtained by numerous silver platers, you should fully investigate the Silver-Glo Process.

If you plate other metals such as copper, nickel, brass, cadmium and zinc, ask for full details of Lea-Ronal Processes. Our Technical Department is at your service in connection with any plating problem you may have.

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Lea Mfg. Co., of Canada, Ltd.
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Plating Polishing Buffing Burring

Are you interested in Buffing, Polishing and Burring Specialties?
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Lea-Ronal Inc.

Sales and Manufacturing Plant: 229 East Aspetuck Street, Waterbury 20, Conn.
Sales office and laboratories: 139-58 Nineth Avenue, Jamaica 35, N. Y.

and, due to its alkaline properties, does an excellent job of brightening.

For best results, it is recommended that the compound be used at the rate of ½ to 1 lb. per 100 pounds of chips with the water level even with that of the mass.

Protective Paper Wrapping

Central States Paper and Bag Co., Dept. MF, 5221 Natural Bridge, St. Louis 15, Mo.

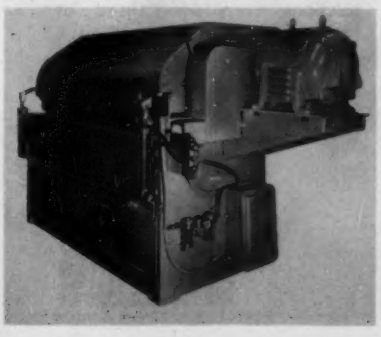
SILiKone Pro-Tex-Mor combines a special treatment of the kraft paper, plus an extra layer of silicone, to protect fine wood, metal and plastic finishes against scratches and abrasion. Its super-smooth surface reduces friction and prevents scratches without the need for bulky and expensive padding. The treatment is a special impregnation of the paper to add lubricity. The silicone additive is not dispersed in the treatment, but lies directly on the surface, giving maximum slip and smoothness to the paper. The silicone formula also increases water resistance, important where the paper is subject to weather during transit, as well as giving additional product protection.

The wrapping is preferable to waxed paper because it will not stick or leave a 'wax transfer" in warm weather. Since its efficiency depends not on bulk, but on its surface treatment, the light weight and large yield make it very economical. It is supplied in bag or sheet form for a multitude of industrial packaging purposes.

Heavy Duty Sanders

Timesaver Sanders, Dept. MF, P. O. Box 7446, Robbinsdale Station, Minneapolis 22, Minn.

"Speedbelt" sanders are now available in heavy duty, high speed models. Design changes introduce a new "ram type" construction with automatic jet abrasive belt tracking. This new construction permits accurate control at high speeds of heavier type work and widens the scope of application possible in finishing, sanding and polishing of all types of materials. Special conveyor belt and roller feed assemblies are available.



The sanders are built in 24" to 54" belt widths and can also be equipped with dual action polishing platen for a "2-in-1" cutting operation on wood and other materials, except metal. Two basic model designs provide for top or bottom sanding of the work or for use in tandem for doing both operations in one continuous material flow on the production line. Prices on the heavy duty models are slightly higher than standard Models SPL and TOP.

Once you use it you'll Order... Again... and Again... and Again!

Every can filled with a full weight of extra high quality 99.75+% Chromic Acid. Prompt delivery made from ample factory and nearby distributor stocks.

BETTER FINISHES & COATINGS, INC.
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Air Powered Parts Cleaner

Equipment Div., Magnus Chem. Co., Dept. MF, South Ave., Garwood, N. J.

Mini-Dip air powered parts cleaner is a new bench type cleaning machine, with built-in air motor, which fits the top of any standard five, six or fifteen gallon open head container.

After mounting unit to the container cover and connecting to air supply, a simple turn of the air valve automatically agitates the basket of parts up and down 100 times a minute through the cleaning solution. The up and down motion of the parts through the cleaning solution vigorously scrubs the parts and shears the dirts from all

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WEAR—*with*
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INDUSTRIAL
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Worklon work clothes resist punishing acids and chemicals . . . actually outlast cotton and wool garments by 50 to 1 as proved in on-the-job tests under corrosive chemical conditions. No need for constant replacement of acid-damaged uniforms! Worklon apparel wears far longer, saves you as much as 93% in work clothes costs! Want proof? See Worklon's new 1958 catalog and information book. It's yours for the asking!

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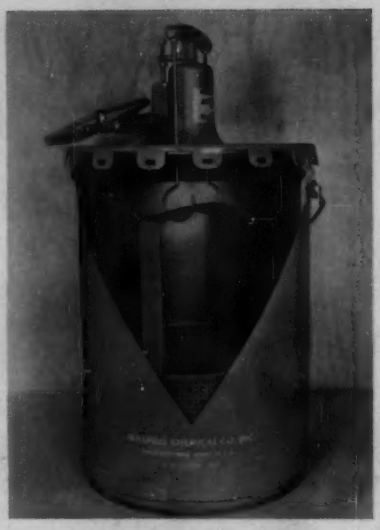


metal surfaces, leaving them ready to rinse and use.

The unit handles up to 50 lbs. of parts at a time. The manufacturer offers a premium kit that includes the machine, round dipping basket and 6 gallon pail.

Barrel Finishing Compounds

Almco Div., Queen Products, Inc., Dept. MF, Albert Lea, Minn.

Five new Supersheen barrel finishing compounds cover processing needs including brightening, grinding, deburring, burnishing and inhibiting rust. Following is the manufacturer's report on the products.

Brightening—No. 407. An alkaline, powdered composition used in cleaning, brightening and grinding ferrous parts, also provides micro-inch improvement, has light rust inhibiting qualities, can be used to clean chips that have become glazed or loaded, and is ideal for removing abrasive film and sludge from barrels after long abrasive grinding cycles. In addition, it serves as a neutralizer after descaling runs, works equally well in submerged or closed barrels, is recommended as an additive during rinsing cycles, and can be used in metal washing machines.

Fine Grinding—No. 408. A powdered grinding compound with a silica flour base for use with all types of metals and alloys. Its extra fine consistency provides low micro-inch finishes and a light satin color is obtained with all medias on stainless steel, copper alloys, die cast and sand cast materials. It is used during long grinding cycles since it will maintain color and retain its cutting powers for up to ten hours.

Atlas

PICKLE TANKS
END COSTLY
REPLACEMENT

. . . outlast wood
10 to 1!

Wooden tanks, because of their inherent instability, create a continuous maintenance and replacement problem. Atlas construction uses corrosion-resistant linings and acid brick joined with the proper corrosion-proof cement to end maintenance problems and give a service life of 10 to 1 over wood. Atlas tanks provide positive corrosion protection.

As there is no drying out or change of dimensions, Atlas tanks will not leak. In addition, they are engineered to withstand hard physical abuse from shifting loads. They resist all pickling solutions even when used at today's elevated temperatures.

Atlas pickle tanks put an end to your costly replacement problems.

Write for Atlas Bulletins 5-2 and C-1.

ATLAS MINERAL
MERTZTOWN, PENNSYLVANIA

It also provides a good surface for painting.

Deburring—No. 410. An alkaline compound designed for light deburring and coloring cycles on ferrous metals. It is recommended where a clean bright finish must be maintained. It may also be used for self tumbling of steel parts where the burr is not excessive and a good color is required.

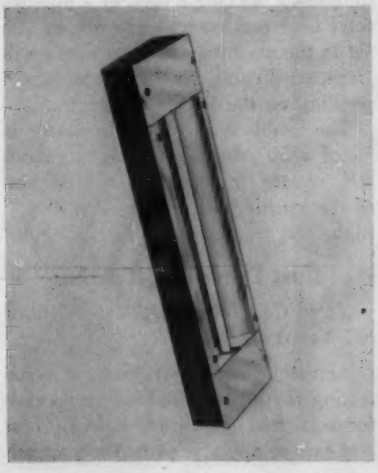
Burnishing—No. 412. This is a highly concentrated burnishing compound with tallow and oil soap base for use with all steel and chip medias on both ferrous and non-ferrous metals in either submerged or standard equipment. It also works well with aluminum and pre-shaped chips and gives excellent results in burnishing cast iron, carbon steel, stainless steel and with aluminum and zinc die castings. Smaller quantities will burnish exceptionally well where low micro-inch finishes and lustrous colors are required. It provides excellent cushioning and lubrication and leaves a good surface for plating aluminum and zinc die castings.

Rust Inhibitor—501R. A concentrated mild alkaline compound designed to inhibit rusting of all ferrous metals has proved more effective and retains a higher burnishing finish than previous rust inhibitor compounds. It leaves a light, uniform protective film which can be easily wiped or washed off as parts are used in production. It is also effective as a dip, used in a solution of four oz./gal.

Infra-Red Test Kit

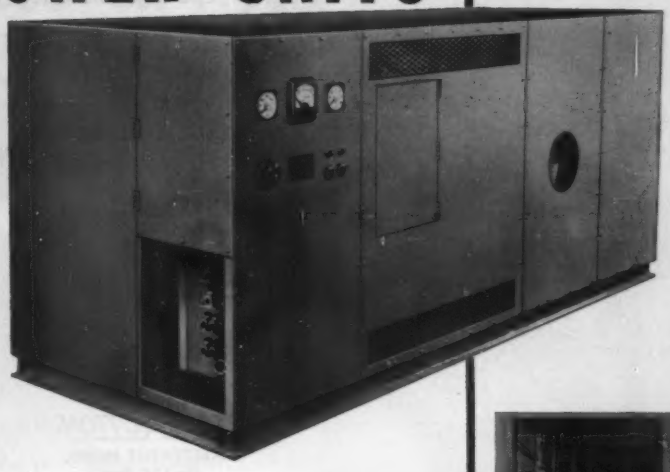
Lighting Division, Safety Industries, Inc., Dept. MF, P. O. Box 70, Milford, Conn.

Potentialities of infra-red heating in a wide variety of processing applica-



SYNTRON a-c to d-c

SELENIUM RECTIFIER POWER UNITS



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SYNTRON Selenium Rectifier Power Units are designed for all your a-c to d-c power conversion needs. Ideal for electro plating, cleaning, polishing and electro chemical processing.

SYNTRON Selenium Rectifier Power Units are engineered to give maximum service with a minimum of cost. The high efficiency, excellent power factor, rugged construction, proven dependability, simplicity of installation and low maintenance make SYNTRON Selenium Rectifier Units the most outstanding power conversion unit in their field.

SYNTRON Selenium Rectifier Power Units can provide efficient, economical, dependable d-c power supplies for your operation.

Interior arrangement of rectifier stacks and heavy bus work.

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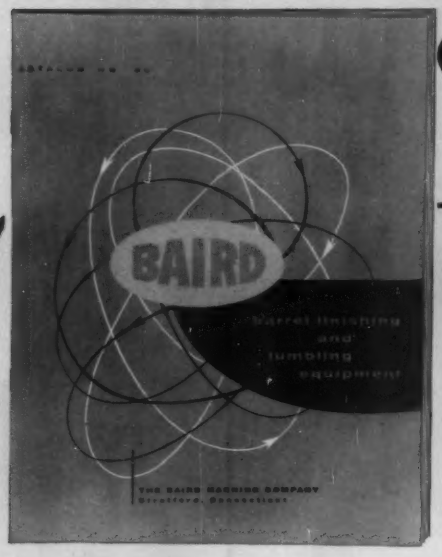

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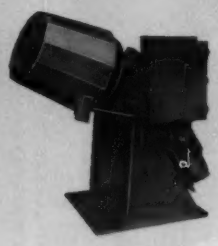

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NEW "MULTIPACT" MULTIPLE HORIZONTAL MACHINES
STEAM AND ELECTRICALLY HEATED BARRELS
BALL BURNISHING MACHINES • TUMBLING BARRELS

BAIRD . . . one of the oldest and largest manufacturers of Barrel Finishing Equipment . . . is your headquarters for practical help on your problems. It always pays to . . .

Write Dept. MF. *Ask BAIRD About It!*

BAIRD

Builders of High Production Machinery Since 1846

THE BAIRD MACHINE COMPANY, STRATFORD, CONNECTICUT

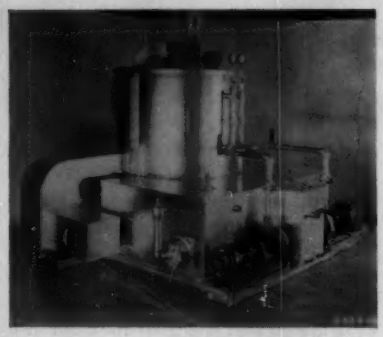
tions can be readily evaluated on a laboratory scale by means of a complete kit which incorporates two different infra-red sources: a 500-watt T-3 quartz lamp with peak emission at a wave length of 1.14 microns (near infra-red); and a 250-watt quartz Infratube with peak emission at 2.34 microns (intermediate infra-red). Priced at $23.65 delivered, the kit includes, in addition to the two heat sources, a compact oven measuring only $4\frac{3}{16}$" x $10\frac{1}{2}$" x $1\frac{9}{16}$", which accommodates either of the lamps; special high-temperature hookup wire; and complete instructions. For maximum ease of laboratory use, the kit is designed for operation from any 110-volt line.

Since the radiation absorption factors of materials to be processed vary widely at different infra-red wave lengths, this lab kit provides an extremely simple and economical means of evaluating infra-red processing in the laboratory as a preliminary guide to engineering production-scale installations.

Parts Washer for Small Batches

Drying Systems Co., Dept. MF, 1800 *Foster Ave., Chicago* 40, *Ill.*

This rotary compartment type washing machine for cleaning small parts in batches consists essentially of a circular housing, containing a circular turntable, divided into 4 sections by partitions, each section the shape of a quarter pie, with vertical walls separating the sections from each other. As the turntable is rotated ¼ turn each time, the work progresses from the loading segment thru a spray wash, spray rinse, hot air dry-off, and thence back to the loading-unloading station, which has a sliding door.



The wash and rinse sections have separate water tanks below these sections, with separate pumps to supply the spray nozzles, which are located above and below the work. The water in each of the two tanks is heated, using gas-fired immersion tubes. The dry-off section is heated with the waste heat from the gas burners on the tanks. A blower supplies the hot air to the dry-off section, and another fan exhausts the air, together with vapors from the spray sections, to the outside.

The rotation of the turntable can be manual, or it can be arranged to move automatically thru the several stages by automatic timing, in which case an audible or visual signal goes on at the end of the cycle, notifying the operator that the machine is ready for the next batch.

A typical timing schedule, whether automatic or manual, would be about 1 minute wash, ½ minute rinse, 3 minute dry-off, plus ½ minute lost in motion, plus 2 minutes for loading and unloading, making a total of 7 minutes total time per batch. The work can be set in the machine either in wire mesh trays, or directly on the turntable, depending on the size of the pieces.

The usable area of the turntable is ¼ of a 50" diameter circle, or about 491 square inches. The overall size of the washing machine is 7' x 8' x 7' high.

Rust Preventive Coating

Arted Co., Dept. MF, 141 *W.* 53*rd St., New York* 19, *N. Y.*

Arrust is a superior, fish oil penetrating coating fortified with a special-formula rust inhibitor. Low in cost and easy to apply, it provides economi-

cal, effective rust prevention on all rusted or rustable metals. It can be used directly over firm rusted surfaces without peeling or flaking. It acts as both a prime and finish coat. Except for severely rusted surfaces, only one coat is necessary. One gallon will cover 300 to 400 sq.ft., with excellent hiding properties.

The product stops rust by penetrating and combining with oxidized material to form an impervious, elastic coating over rusted surfaces. It is also highly resistant to moisture, atmospheric conditions, acids, oil and most chemicals. Supplied in tile red, medium gray or jet black, the coating is also available in other colors on special order.

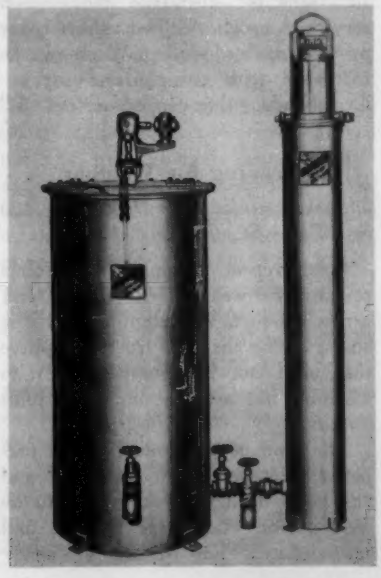
Retail prices: quarts — $2.45; gallons—$6.90; five-gallon can—$34.00. Openings are available for dealers and distributors.

Paint Circulating Pumps

Binks Mfg. Co., Dept. MF, 3122 Carroll Ave., Chicago, Ill.

For extra high volume paint circulating systems, the "Kayo" series of paint pumps is designed to make all large industrial finishing operations more economical and efficient. The pumps are designed to deliver a steady flow of paint while operating at minimum speeds, at less air consumption as compared to ordinary pumps.

All of the pumps in the series feature the automatic demand principle. When demand on the system is low the pumps operate more slowly, but when more spray guns are opened the pumps speed



up immediately to supply more material. Air consumption with the new pumps is only 2 cfm per gallon at delivery pressure of 80 psi.

Because the new pumps are designed so that air motor and pump section are completely separate, there is no possibility that paint will enter the motor and cause malfunction or damage. Other features include self-lubricating air motor piston cups, high density alloy pump castings and double tube construction for permanent rigid alignment.

The 32, largest of the series is designed to deliver 32 ounces of paint with each stroke, or one gallon every two cycles. The pump's long stroke means users can expect more paint delivery on each stroke with less wear and longer life.

The pump is capable of supplying paint through more than a mile of circulating line. With its large capacity, the pump is capable of supplying up to 55 spray painting stations. The 16 has half the capacity of the 32.

Air Filter & Water Separator

Gray Co., Inc., Dept. MF, 1005 Sibley St. N.E., Minneapolis 13, Minn.

A new, extra-large capacity air filter and water separator is designed to remove all dirt, scale and moisture from both line air and regulated air for paint spray operations.

Special features of this new Graco

How Pure Need Your Silver Anodes Be?

HANDY & HARMAN MAKES THEM 999+ OR FINER IF YOU SPECIFY

For general commercial work, Handy & Harman anodes are 999+ fine. And it makes no difference in what shape or size they're made: ball, rod, plate, strip or sheet, they all have the same uniformly high degree of purity. What's more, if you want still finer anodes, you can specify the AA grade for high-speed plating, or finer, if desired. Handy & Harman supplies them all.

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French Grey Solution
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We are fully equipped to reclaim old gold and rhodium solutions.
No charge for small sample plating.
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Consultive Service
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air control include two regulated air valves that permit use of two spray guns operating on different pressure settings. Line air pressure is also available through two additional valves. Permanent, porous bronze filter traps all foreign particles.

Two air-powered pumps and two spray guns are easily supplied with clean, dry air by just one of these new air filters, eliminating the need of separate filter for each pump and spray gun.

Chromium Plating Anode

Republic Lead Equipment Co., Dept. MF, 7930 Jones Road, Cleveland, Ohio.

A new round chromium plating lead anode, at prices ranging from 25% to 40% less than conventional round anodes of comparable size, is hollow, thus effecting substantial savings in weight as well as in cost. The hollow anode is claimed to offer virtually the same wear life as the solid anode.

The key to the new design is the method used to attach the hook to the hollow anode. The anode is flattened and the hook homogeneously burned to the anode. The bond formed will last the life of the anode. Burning the hook directly to the anode makes it possible to provide a vent hole well above the solution level to vent gases and fumes.

Republic hollow round lead anodes are made in two sizes: 1½" and 2" o.d. with wall thickness of ¼" and ⅜" respectively. Length is as specified. They can be provided with any one of six hook styles. Hooks can be furnished plain or protected with Tygoflex plastisol.

Acid Hose

B. F. Goodrich Industrial Products Co., Dept. MF, Akron, Ohio.

A new acid hose is claimed to outlast conventional acid hose in highly corrosive service. Commander acid hose contains a special hose tube made of newly developed acid-resisting material. The tube withstands 96 per cent sulfuric acid at 70°F., as well as strong oxidizing acids and other chemicals.

The new hose is available in two constructions for discharge and suction service. A tough, resilient rubber cover protects against scuffing. Hose can be furnished with straight ends or enlarged ends, either capped or "cut-off."

Cleaning for Welding

Spekaluminite Co., Dept. MF, 100 So. Water St., Ossining, N. Y.

Costly repeat cleaning of steel joints prepared for welding is eliminated with a new product, Weldaluminite. This is stated to be the only rust preventive that need not be removed prior to welding, but actually improves joint quality.

The product will protect freshly prepared joints and vees from rust and corrosion until they are ready to be welded, for weeks if necessary, and also inhibits the rusting of newly

welded seams. This makes it possible for parts to be conveniently cleaned in the shop and then transported for field erection and welding without recleaning. Steel stock stored outdoors can be protected with great savings in time and labor.

Readily applied by brush, spray gun, or dipping, the material leaves no objectionable residue or slag.

Barrel Finishing Equipment

Techline Div., Wheelabrator Corp., Dept. MF, 1150 *Avenue V, Vicksburg, Mich.*

Vibration-free operation characterizes a new line of precision barrel finishing equipment known as the Model 30 series. The equipment is reported to

be so stable that a coin balanced on edge on the housing will remain standing throughout the entire operating cycle.

Other features include: Molded fiberglass safety gate which is corrosion-proof and lightweight for easy operation; full-opening doors on the cylinder for greater convenience in loading, unloading and cleaning the cylinder; doors "super-sealed" by special cam locks which operate on only 90° of turn, exerting high-compression pressure on the Neoprene door seals.

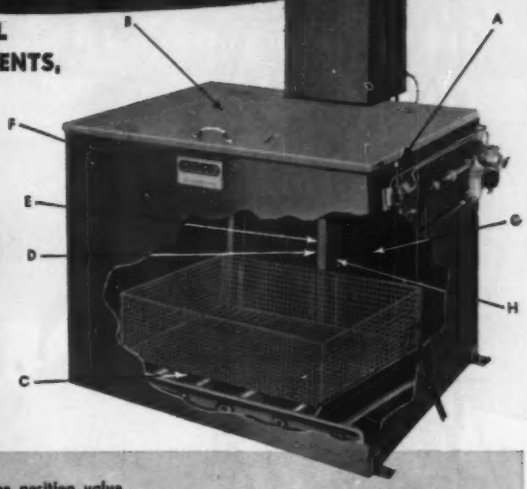
Power transmission is by an exclusive V-belt drive which is noiseless, reduces maintenance problems and reportedly wears longer than a chain-and-sprocket drive. The equipment also features safety controls to prevent the machine from operating with the gate open except for "jogging," and an attractive fiberglass housing which guards the entire drive mechanism.

The machines are offered in 20 models ranging from 5 to 30 cu. ft. capacity, and having one to six separate compartments, designed for both wet and dry processes.

Standard cylinders are lined with ¼" calendered Neoprene to eliminate porosity and increase lining life. Other linings include ¼" rubber, ½", ⅜" or ¼" rubber or Neoprene, and ¼" steel plate.

Power AGITATION Cleaners
PNEUMATICALLY OPERATED

FOR USE WITH ALL CLEANERS — SOLVENTS, EMULSIONS, PHOSPHATIZING AND ACID SOLUTIONS FOR HEAT TREATING, QUENCHING, WAX AND PROTECTIVE COATING AND OTHER LIQUID PROCESSING.



A. Only one control—three position valve. 1. raises rack. 2. lowers rack for soak. 3. agitates rack.

B. Hinged steel cover. Fusible link causing lid to drop in event of fire, optional.

C. Supplied with grate platform. Roller rack platform available.

D. Length of up and down stroke variable from 4" to 27"

E. Number of strokes variable from 32 to 70 per minute.

F. Tank shell is fabricated of solid heavy gauge hot rolled steel.

G. Available with immersion heating choice of steam - gas or electric.

H. The same air operated piston lowers, raises and agitates the rack.

Since 1923 CIRCO EQUIPMENT COMPANY

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51 TERMINAL AVE., CLARK, NEW JERSEY

Offices and Representatives in Principal Cities

Solenoid Valves

J. D. Gould Co., Dept. MF, 4707 *Massachusetts Ave., Indianapolis* 18, *Ind.*

Type Q (normally closed) and Type QR (normally open) valves are fully automatic, 2-way, packless, bronze bodied, and piston-pilot operated. Sizes are ⅜" to 3". The new valves are for use with heavier liquids, air and gases to 400 psi (steam to 200 psi) and temperatures to 450°F.

Standard features include heavy duty coil assembly for handling heavier

The Leading Name in Immersion Heating

All 3 Types

- INSTANT HEATING
- SHORT-PROOF
- AVAILABLE IN ALL VOLTAGES—WATTAGES, one and three phase
- STOCKED FOR IMMEDIATE SHIPMENT

TYPE "U"
PATENT PENDING
World's first successful U-tube **ACID** Heater—Guaranteed to outperform and outlast all other quartz heaters.

TYPE "GN"
Pat. No. 2,740,881
Standard straight tube Quartz **ACID** Heater—Vapor-proof junction box; replaceable heating element.

TYPE "MB"
"Multi-Blade", Metal-sheathed **ALKALI** Heater—Portable, burn-out proof, easy mounting, long life.

WRITE FOR BULLETIN

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ACCURACY—EFFICIENCY—LONG LIFE—and ECONOMY
...you'll get it with Glo-QUARTZ!
Available from your Electroplating Distributor!

Glo-QUARTZ ELECTRIC HEATER CO., INC.
Trademark Reg. U.S. Pat. Off. WILLOUGHBY, OHIO Phone: Willoughby 7-3321

fluids, unbreakable piston rings, waterproof epoxy resin coils guaranteed unconditionally for one full year, and guided pilot valve seat to insure positive seating with minimum wear.

High temperature coils and explosion proof coil housings are optional at slight extra cost. According to the manufacturer, the new series offer more features as standard equipment at a lower price than any other valves on the market.

Phenolic Protective Coating

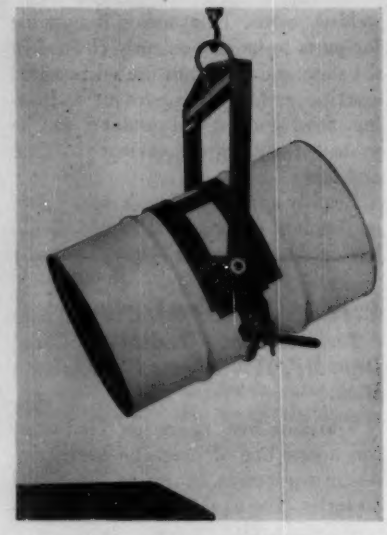
Wisconsin Protective Coating Co., Dept. MF, P. O. Box 243, Green Bay, Wis.

A high bake phenolic protective coating with complex polymers has excellent caustic resistance in addition to the normally superior resistance to acids and solvents. Plasite #6060 requires only 2 to 3 coats to achieve sufficient film thickness for protecting chemical process equipment, it is claimed.

Drum Carrier

Morse Mfg. Co., Inc., Dept. MF, 727 W. Manlius St., East Syracuse, N. Y.

The new and smaller version of the Model 85 Drum-Karrier will provide a dependable method of moving 30 gallon drums via monorail or crane. The new carrier will allow the worker to easily hook it to a monorail hoist, crane or chain block; to snap the saddle between the barrel chines, to



cinch tightly and then to transport, tilt or mix, or dispense the contents over a receiving tank. Positive tilt locks hold the drum in a vertical position during travel and also permits easy controlled pouring. The device has a 500 lb. load capacity and is of steel construction.

Silicone Antifoams

Hodag Chemical Corp., Dept. MF, 7247 N. Central Park, Chicago 45, Ill.

Free samples of a new series of silicone antifoams are now available from the above manufacturer of specialized antifoams and other surface active agents. These new formulations are stated to give the user all the efficiency of standard silicone antifoams at a substantial cost saving.

Polyethylene Syphon

General Scientific Equip. Co., Dept. MF, 7516 Limekiln Pike, Philadelphia 50, Penna.

An all-polyethylene syphon with a built-in "self-starter" consists of a semi-rigid "U" tube which has an open end and a flexible "squeeze" bulb attached to the other end. The squeeze bulb has a stopcock outlet.

To operate the syphon, the user first places the open end of the "U" tube in the liquid to be syphoned. The stopcock is then closed. Squeezing the bulb primes the syphon by forcing air out of the open end into the liquid. When the bulb is released, the partial vacuum created sucks the liquid into the open end, over the "U" bend in the syphon tube and, when the stopcock is opened, into a waiting receptacle.

Safe and simple to use, the syphon is easy to clean and practically unbreakable. It is resistant at normal temperatures to concentrated acids, oxidizing agents, hydroxides, and polar liquids.

The syphon comes in two sizes. Size 1 has a half-inch I. D. tube for use with large drums and carboys. Size 2 has a one-quarter inch I. D. tube for use where a slower flow is suitable. Prices: size 1—$10.00; size 2—$7.50.

Phosphating Process

Turco Products, Inc., Dept. MF, 6135 *So. Central Ave., Los Angeles* 1, *Calif.*

A new phosphating material that provides a tight bond for paint, other organic finishes and metal drawing, deposits a zinc phosphate coating on iron, steel, zinc and cadmium of up to 400 miligrams per square foot.

Designed for use on any fabricated parts, Turcoat 4333 meets USA-50-O-2C, Type II, Class C and MIL-S-5002. It may be applied by either spray washer or immersion.

Corrosion Resistant Paint

Industrial Finishes Co., Inc., Dept. MF, 1119 *Land Title Bldg., Broad & Chestnut Sts., Philadelphia* 10, *Pa.*

A new chemical paint, called Ifco catalytic protective coating, is a combination of vehicles and rust-inhibitive pigments with a catalytic agent, to provide a chemical treatment and rust-inhibitive coating in one application.

The paint is claimed to possess excellent top coat durability, when unprotected by top coats. It will dry-to-handle in five to ten minutes. Once the film has been thoroughly dried by catalyzation, it cannot be removed except by sandblasting or other vigorous methods.

GRIND
POLISH
BUFF
DEBURR

with a Hammond ROTARY AUTOMATIC

SEND SAMPLES and we'll show you how much you can speed production and cut costs.

Model "K" Hammond Automatic Finishing Machines are made in 34", 46" and 62" table sizes. These models are either continuous or for indexing at 150 to 1700 indexes per hour. Head styles include floating, non-floating with 3 H.P. to 20 H.P. range. Also available are attachments for converting heads from buffing to abrasive belt polishing. The Hammond Model "K" will speed up your grinding, polishing, buffing, brushing and de-burring operations. Send us samples and learn how much you can speed them up.

Hammond Machinery Builders INC

1601 DOUGLAS AVENUE KALAMAZOO, MICHIGAN

SEE US NAT'L EXPOSITION — BOOTH 1250 — OCTOBER 27-31 — CLEVELAND

Unit Dust Collectors

The Kirk & Blum Mfg. Co., Dept. MF, 3100 *Forrer St., Cincinnati* 9, *O.*

Although three model sizes of the new Type "M' unit dust collectors are available, 450-900-1800 c.f.m., the largest unit is only 26" x 40" x 72½". This unusual compactness is achieved by careful placement of equipment within the rigid, durable enclosure.

In all sizes, the dust-laden air is delivered to a small diameter, high efficiency, centrifugal pre-cleaner where all but the finest particles are removed. The air then passes through steel wool filter pads, three inches thick, for final cleaning. Dust receptacles are gasketed, sliding drawers, secured with a hand wheel to insure a leak-proof seal. The after-cleaner, readily accessible through an expanded metal panel, usually requires cleaning not more than once in two weeks, depending on usage.

Where conditions will not permit the re-entry of cleaned air into the working area, the filters are replaced with air-tight closures and the air vented to the outside. Exhaust stack connections are furnished at top of the unit.

Both re-entry during the winter months to conserve heat, as well as

USE **BLACOSOLV.**

Get the best possible solvent—plus invaluable professional advice!

When you buy Blacosolv you profit two ways. Blacosolv trichlorethylene assures better parts cleaning due to the entirely new and different stabilizers that prevent solvent breakdown and acid formations. Then too, you receive periodic visits from your representative, who offers you friendly, professional assistance whenever you require it.

Here's What One Manufacturer Wrote:

"When we contacted your representative he immediately visited our plant and helped us to correct the faulty operation of the machine. While this may be considered as part of his duties in your company, to us it meant a savings of dollars in lost time, and enabled us to immediately start production."

J. GRANDOLFI, *Production Manager*
Dept. 102-B, MALLORY BATTERY CO., North Tarrytown, N.Y.

*Blakeslee's Brand of stabilized degreasing solvent.

G. S. BLAKESLEE & CO. 1844 So. Laramie Chicago 50, Illinois

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venting during the summer for ventilation, are accomplished by equipping the unit with both exhaust stack and filters. The change is affected simply by turning a damper in the stack.

The extra heavy housings of the units are $\frac{1}{16}$" sheet steel, welded construction, for greater rigidity and durability. Exhausters are heavy duty industrial type, direct connected to a 3600 rpm., 220/440 volt motor. The motor is amply ventilated and readily accessible through a removable expanded metal panel. Both motor and exhauster are completely isolated from dust to eliminate fire hazard. Connections between exhauster and pre-cleaner are made with $\frac{3}{16}$" thick rubber sleeves to minimize noise and vibration.

Spray Gun Bracket

H. G. Fischer & Co., Dept. MF, 9451-91 W. Belmont Ave., Franklin Park, Ill.

A new type of spray gun bracket is available for use with any type of automatic spray gun or painting system. The bracket is made of cast aluminum and supports the spray gun in a rigid manner but still gives maximum flexibility. It clamps to a vertical 2" diameter tube. A knurled aluminum knob is tightened by hand to lock the gun in place. A wrench is not needed to make normal adjustments. The bracket will not bind due to paint accumulations on the vertical tube.

The spray gun can be pivoted in a vertical plane and can be angled upward or downward. The aluminum bracket is designed to prevent accidental falling, twisting, or turning of a spray gun out of its proper position. Once the guns are locked in position, they stay put.

When forward or backward movement of the spray gun is required, the 2" diameter vertical support tube is mounted on a movable overhead carriage. This carriage can be moved forward or backward and locked in any desired location.

Finish Stripper

Chemclean Products Corp., Dept. MF, 15-08 121st St., College Point 56, L. I., N. Y.

A new development for the stripping of vacuum metalized reject parts and racks, Vac-Strip #3 is a unique liquid formulation that is miscible with water, contains no volatile solvents and is non-flammable. When diluted with water and heated to 160-212°F stripping occurs immediately. The lacquers and aluminum are completely dissolved by the stripper and held in solution, thereby eliminating the problem of drag-out. Rinsing properties are excellent. Time for stripping varies from 15 sec. to 5 min. As an added feature, the product will also de-rust and prevent rust forming on steel parts. When used properly, it will also strip the

metalized coatings from phenolic plastics without damaging the plastic.

Anode Protection

The McGean Chemical Co., Dept. MF, 101 *Prospect Ave., N.W., Cleveland* 15, *Ohio.*

The above manufacturer announces two new developments for the improvement of its Besplate nickel anodes, which it states have had consistent, dependable high purity for many years.

The anodes are now electrolytically treated just prior to shipment in a novel manner providing a chemically clean silvery surface to each anode. According to the announcement, platers need no longer clean anodes after arrival to avoid introduction of oils, greases or dirt into plating solutions.

An attractive new package in the form of a container has been designed to deliver the chemically clean anodes in perfect condition. The container is said to be strong and the contents well marked, making for easy stacking for storage and space saving.

BUSINESS ITEMS

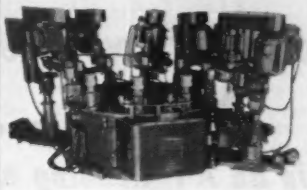
New Company Formed

A new company, *Chemray Corporation,* has been formed, with *R. L. Ledford* as president. The firm will represent many of the leading manufacturers of chemicals, equipment and supplies for the metal finishing industry.

R. L. Ledford

The firm is located at 10052 Roosevelt Rd., Westchester, Ill., telephone number FIllmore 4-2400.

Modern mass production methods demand speed, efficiency, and economy in finishing operations. PACKER-MATIC'S completely automatic polishing, buffing, and deburring machines are engineered to handle any type of production finishing problem. Let Packer show you how long runs, short odd lot jobs or a mixture of both can be handled with fast, low cost, more uniform results. Send blueprints or sample parts and let our engineers recommend a PACKER-MATIC to meet your requirements, or write today for more complete information.



* The bright touch on housewares is just one of many successful PACKER-MATIC applications.

PACKER-MATIC

THE PACKER MACHINE COMPANY • MERIDEN, CONN.

Pioneer Manufacturers of Automatic Polishing and Buffing Machines

Du Pont Co. Announces Personnel Changes

Arthur I. Mendolia, an assistant director of sales of the *Du Pont Company's* Electrochemicals Department, has been named assistant general manager of the department.

He succeeds *W. Samuel Carpenter, 3rd,* who became general manager of the company's International Department which was designated an industrial department. It formerly was one of the 13 auxiliary departments.

Mr. Mendolia, 41 years old, has had extensive experience in research, production, and sales work in the Electrochemicals Department. Starting in 1941 as a chemist at the Niagara Falls, N. Y., laboratory, he went into production work in 1943 as a process development engineer and became assistant process supervisor of chlorine products two years later.

In 1946 he was placed on special assignment to assist in the design of a new unit at the plant to produce adiponitrile, a nylon intermediate, from furfural and, following the construction of this unit in 1948, he was made a development group leader, then senior producion supervisor, and finally, superintendent of the furfural products area.

He was appointed technical superintendent of the east plant, comprising the furfural and vinyl products areas, in 1952, and was transferred to Wilmington in August, 1954, as assistant di-

rector of research. On April 1, 1956, he became an assistant director of sales.

Mr. Mendolia was born on May 6, 1917, in Brooklyn, N. Y. In 1941 he received a bachelor of science degree in chemical engineering from Case Institute of Technology.

He is a member of the American Chemical Society, American Institute of Chemical Engineers, and Alpha Chi Sigma fraternity.

A. B. Plating Supply Moves to New Quarters

A. B. Plating Supply Co. announces their new address — 3033 West Layton Ave., Milwaukee 15, Wis.

Sel-Rex Promotes Mitwol

The promotion of *Sid Mitwol* to general manager, Rectifier Division, has been announced by *Sel-Rex Corporation*, Nutley, N. J. In his new position, Mr. Mitwold will be responsible for all the activities of the division, including sales, manufacturing and new product development.

Having joined the firm in 1948 as sales engineer, Mr. Mitwol has progressed through positions of increasing executive responsibility, and was

Sid Mitwol

manager of the firm's Detroit office prior to his current assignment.

A graduate Electrical Engineer of C. C. N. Y.'s School of Technology, Mr. Mitwol was formerly associated with Federal Telephone and Radio Co. and Radio Receptor Co., Inc.

New Subsidiary Formed by DeVilbiss for Metal Fabricating

Additional facilities to provide complete finishing systems to industry are now offered by *The DeVilbiss Co.* through a new wholly owned subsidiary, *DeVilbiss Metal Fabricators Co.*, Detroit. The new firm is the result of the consolidation of the *Peters-Dalton Division* of *Detroit Harvester Co.* and *Newcomb-DeVilbiss Co.*

Both are engaged in the manufacture of industrial ovens, heavy-duty water-wash spray booths, parts washers, dust collectors and a wide variety of kindred equipment, metal-cleaning and rust-proofing machines, pickling units, dip systems, continuous or intermittent systems, flow coaters and replacement air systems.

Reber C. Stupp, formerly general manager of Peters-Dalton, has been named vice president and general manager of the new company. *J. W. Cornelius*, former head of engineering for Newcomb-DeVilbiss, vice president-engineering and *T. Kenneth McGuire*, former sales head for Peters-Dalton, vice president-sales.

Headquarters of DeVilbiss Metal Fabricators will be maintained at 17,900 Ryan Road, Detroit, and manufacturing facilities will be utilized at both the Ryan Road address and in the former Newcomb-DeVilbiss plant at 5741 Russell St., Detroit. Headquarters

Bigger Dividends Than Ever from your investment NOW . . . in an A-F Cleaning or Processing Machine

In spite of today's shrinking profits, progressive management is finding this a GOOD time to invest in new A-F Cleaning and Processing Equipment.

By cutting costs and providing "quality control" impossible with older equipment, A-F Cleaning and Processing Machines—both "standard" and specially engineered types—give you a competitive edge . . . now and for the future.

Write for FREE 28-page brochure . . . TODAY!

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A-F *ENGINEERED* Cleaning and Finishing Machines
Plant-Wide Conveying Systems
THE ALVEY-FERGUSON CO., 503 Disney St., CINCINNATI 9, OHIO and Azusa, Calif.

BUFFS FOR INSIDE POLISHING

GOBLET BUFFS, TAPER BUFFS, CYLINDER BUFFS, SMALL POLISHING WHEELS, RAZOR EDGE BUFFS, and many others for deburring, polishing and grinding any internal contour.

Write for additional information or contact your local dealer. These buffs are stocked by many dealers throughout the country.

We manufacture a COMPLETE LINE OF BUFFS including full disc loose and sewed buffs and polishing wheels. Our metal center BIAS TYPE BUFF may help cut your polishing costs.

Your request on your letterhead will bring our complete catalog by return mail.

BARKER BROTHERS INC.
ESTABLISHED 1911
1660 Summerfield Street Brooklyn 27, N. Y.
Canadian Distributor — LEA PRODUCTS COMPANY, Montreal

of the parent company are in Toledo, Ohio.

Allied Research to Distribute Cowles Cleaners

Allied Research Products, Inc. has announced that negotiations have been completed for the company to represent *Cowles Chemical Co.* on its complete line of cleaners for metal finishing.

Effective immediately, Allied Research will provide sales representation and service from coast to coast on the above products.

Foreign Operations Department Formed by Graver

Graver Water Conditioning Co., New York, has announced the formation of a new Foreign Operations Department, *Jesse D. Crell* has been appointed manager. The new unit will work in conjunction with the International Division of Graver Tank & Mfg. Co., Inc., a subsidiary of Union Tank Car Co.

The function of the department will be to expand the world-wide organization of representatives handling the firm's complete line of equipment for industrial water and waste treatment.

Expansion of foreign operations for the present will be made with particular emphasis on Central and South America, according to the company. As part of its program, the department will establish additional sales agencies, foreign licensing agreements and, where practical, foreign fabrication facilities.

Mr. Crell brings to his new post a wide and varied background. He is a chemical engineer with a degree from the University of Michigan. He holds a Masters Degree in International Trade from the Bernard Baruch School of Public and Business Administration, City College of New York. He has been with the company for six years. During that time, he has had experience in the technical, engineering and service phases of liquid treatment.

Jesse D. Crell

Mr. Crell is a member of many trade associations including the American Institute of Chemical Engineers, American Chemical Society and American Water Works Association.

Cro-Plate Rights Acquired by Pressure Blast Mfg. Co.

Pressure Blast Mfg. Co., Inc. of 27 Pleasant St., Manchester, Conn., announces the acquisition of all assets and manufacturing rights of the former *Cro-Plate Co.* of Hartford, Conn. The entire line of wet blasting equipment and abrasives is being continued. Manufacturing and sales offices have been re-located at the Manchester address. The equipment and abrasive continues to be distributed by leading plating and polishing houses throughout the country and Canada.

Heil Announces Promotions

Heil Process Equipment Corp., Cleveland 2, Ohio, has announced the appointment of *Robert I. Peters* to be assistant chief engineer; *R. E. Scheel* to western sales manager; and *R. A. Brown* to Chicago sales engineer.

Peters, who has been with the company during the past 12 years as estimator, sales engineer and, more re-

For pickling and metal plating . . . wherever corrosive acids and other chemicals are used . . . Manhattan Rubber Linings give you the cost-saving protection you need. Manhattan engineers have developed a method of bonding multiple calendered sheets of rubber to metal so securely, mechanical pull tests prove they can't be separated! This means you get *permanent* protection against corrosion of your equipment . . . *permanent* protection against contamination of solutions used in processing. It's the kind of protection that has kept many Manhattan Rubber Lined tanks in continuous use for over 30 years!

Manhattan Rubber Linings won't harden, crack or oxidize . . . even under extreme changes in temperature. To assure lifetime protection, every tank lined by Manhattan is tested under high voltage to detect any possible imperfection before it is shipped to your plant. And Manhattan has the facilities to handle any tank that can be shipped. Let an R/M lining engineer show you why Manhattan Rubber Linings can assure you the protection you need for costly plating and pickling equipment. Contact the Manhattan rubber lining facilities nearest your plant.

RM 938

RUBBER LINING PLANTS AT PASSAIC, N. J. • NORTH CHARLESTON, S. C.

MANHATTAN RUBBER DIVISION—PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.

Manufacturers of Mechanical Rubber Products • Rubber Covered Equipment • Radiator Hose
Fan Belts • Brake Linings & Blocks • Clutch Facings • Packings • Asbestos Textiles
Engineered Plastic, and Sintered Metal Products • Abrasive & Diamond Wheels • Bowling Balls

Robert I. Peters

R. E. Scheel

cently, as western division sales manager, is a graduate of Fenn College in Mechanical Engineering, and is also president of the Cleveland Branch of the A. E. S.

Scheel, who graduated from Ohio University, has been with the company 8 years, first in Cleveland and more recently in Chicago as district sales manager.

Brown, who graduated in Mechanical Engineering from the University of Michigan, was formerly district engineer in the Detroit office.

Wheelabrator Acquires Crandall Engineering, Forms Barrel Finishing-Wet Blasting Division

Formation of a new barrel finishing and wet blasting division has been announced by *Wheelabrator Corp.*, Mishawaka, Ind. By acquiring the assets of *Crandall Eng. and Mfg., Inc.*, Vicksburg, Mich., the company adds a complete line of barrel finishing machines. Manufacturing and sales headquarters will be in Vicksburg. Complete experimental and demonstration laboratories will also be maintained there.

General manager of the new division will be *Jacob A. Schmidt, Jr.*, secretary-treasurer of the parent company. *George H. Lieser* will be wet blast product manager and *Roy T. Romine* will be barrel finishing product manager and chief engineer.

Lieser has been with the firm, as department head of the line of wet blast equipment, for the past eight years. Prior to that, he was associated with another manufacturer of wet blast equipment and also was a manufacturers' representative in the Cleveland area for five years. He is a registered professional engineer.

Romine, who founded Crandall Engineering in 1957, previously was associated with a barrel finishing equipment manufacturer as chief engineer. He is a member of the American Society of Tool Engineers.

MAN IN A PICKLE
(A TRUE STORY)
Dick, we just shut down the zinc plating line again. Same old story . . . parts are dragging soil over and contaminating the pickle tank.
That's the last straw, Mike. This time we've got to get results. I'm calling Steve Choren of Pennsalt, right now!
THE FOLLOWING WEEK
...I recommend Pennsalt Cleaner K-8. K-8 blasts off smut. It also neutralizes acid soils, and works well in hard water. You see K-8 contains no water. It gives you more cleaner, at lower cost.
Sounds good, Steve. Let's see what Pennsalt K-8 can do to cure the prize production headache in this shop.
I see your zinc plating line's going full blast.
Steve, you've got a first-class electrocleaner in Pennsalt K-8. K-8 carries as much current at 8 oz. as our old cleaner did at 10 oz. And on top of that, we're adding less K-8 to maintain concentration.

Du Pont Appoints Railway Finishes Expert

Roy A. Robichaud has been named railway finishes representative for the Atlanta regional sales office of the *Du Pont Company's Finishes Division.*

Mr. Robichaud was graduated from Boston College with a degree in chemistry in 1947 and, after a two-year period as a laboratory assistant, took his master's degree and joined the company as a paint chemist. While working in the Marshall Laboratory in Philadelphia, one of the nation's largest research centers in the paint field, Mr. Robichaud's activities centered around formulating railway finishes and making technical field contacts in that industry. He took over the new assignment on July 1 and is living in Raleigh, N. C.

Three Top Turco Executives Promoted

Appointment of a new vice-president, general sales manager and assistant to the vice president has been announced by *Turco Products, Inc.*, manufacturer of chemical processing compounds. Elected as vice-president-marketing is *Dan T. Buist,* for the past 7 years director of sales. Appointed general sales manager is *Archie K. Beard,* who has held various supervisory sales positions with the firm over the past 10 years. Named as assistant to vice president-marketing is *Stewart B. Van Duyne,* for 7 years administrative assistant to the director of sales.

Mr. Buist, one of the oldest employees from point of service, joined the 31-year old Los Angeles corporation in 1936 as a general line salesman, after 10 years in the automotive business in Los Angeles. During the years that followed, he worked his way through the ranks of the sales department, holding the positions of district manager, zone manager and assistant sales manager. In 1950, he became national sales director and, in 1952, he was elected to the board of directors as director of sales.

Mr. Beard, a technical man turned salesman, joined the company in 1945 as a process engineer. In 1948 he was appointed a district sales manager and progressed to manager of Air Force sales and manager of Metal Processing Division, working in the Chicago area.

Dan T. Buist | Archie K. Beard | Stewart Van Dyne

...so I figured maybe you could help us, Steve. The cleaners we've been using just aren't getting the heavy oil and carbon smut off these parts. Got any suggestions?
Looks like your job calls for a real heavy duty electro-cleaner, Dick, one that delivers top performance even when your tanks are heavily contaminated with soil. That's why...
Yes, I talked to the boys as I came through the shop. Sounds to me as though K-8 surpassed even my expectations.
Ours too, Steve. K-8 is doing a whale of a job. I can honestly say that we wouldn't change materials now even if we were offered another cleaner at lower cost.

Makes good sense to improve metalworking with chemical know-how . . . gained from wide experience in the field. Call in your Pennsalt salesman. He can help you to "A BETTER START FOR YOUR FINISH."

METAL PROCESSING
DEPARTMENT 572
PENNSALT CHEMICALS CORP.
3 Penn Center, Philadelphia 2, Pa.

Pennsalt Chemicals
ESTABLISHED 1850

A better start for your finish

In 1956 he was transferred to Los Angeles as sales manager.

Mr. Van Dyne joined the firm in 1945, shortly after his discharge from the U. S. Army, in which he served as a captain in the European Theater. He has had experience in exports, pricing, contracts and was manager of national accounts. In 1951 he was named administrative assistant to the director of sales.

Ross Appointed by MacDermid Inc.

As part of an intensified expansion program in both plant facilities and staff, *MacDermid Incorporated*, Waterbury, Conn., recently appointed *Daniel H. Ross* sales trainee. Mr. Ross will receive training in the company's laboratory where metal finishing chemicals and compounds are tested under actual production conditions. Following this tour of duty, the new sales trainee will be assigned to work with a company representative for additional training in the field.

Mr. Ross attended Wayne University

Daniel H. Ross

and The University of the Philippines. He served three years in the U. S. Army, two years of which were spent in the Philippine Islands. Before joining MacDermid, Mr. Ross was employed as a sales and service representative at the Promat Division of Poor & Co. Prior to that, he was a general customer service man with Ross Industries, Detroit, Mich.

International Rectifier Names Cataldo Vice-President

The board of directors of *International Rectifier Corp.*, El Segundo, Calif., has appointed *J. T. ("Joe") Cataldo* vice-president in charge of sales.

Mr. Cataldo came to the company in 1952, as sales manager and assistant general manager. Previously, he was project advisor responsible for research and development activities on metallic rectifiers and other products at the Signal Corps Engineering Laboratories at Fort Monmouth, N. J. He served as assistant section chief of the Instrument Section at the Materiel Laboratory of the New York Naval Shipyard from 1941 to 1948, and before that was supervisor in charge of design of explosion-proof buildings at Raritan Arsenal, Army Ordnance Dept., Metuchen, N. J.

Mr. Cataldo holds engineering degrees from Clarkson College of Tech-

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Technological knowledge acquired through many years of experience, plus special processes and equipment, assure the high quality of our Rhodium Plating Solutions.
Recommended for contact surfaces of switches, waveguide parts and other electrical applications, such as printed circuits...Can be applied in extremely heavy deposits, up to 100 milligrams per square inch.
Rhodium plating provides the advantages of whiteness, lustre and corrosion resistance of a precious metal.
Consult our staff about plating problems.
Specialists in the Unusual
Since 1901
SIGMUND COHN MFG. CO., INC.
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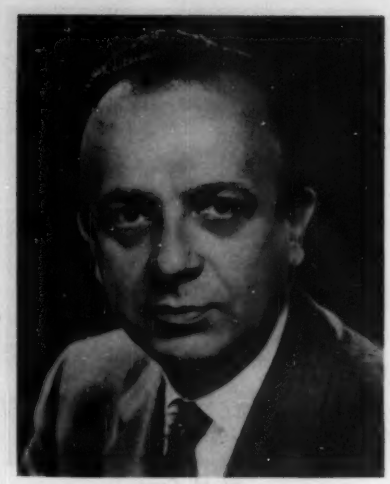

J. T. Cataldo

nology and Brooklyn Polytechnic Institute, and has done graduate work at B.P.I. and Rutgers University. He is a member of the Institute of Radio Engineers, has authored more than 60 papers on theory and applications of metallic rectifiers, and now holds several patents pertinent to this industry.

Gulton Industries Names Director of Engineering for Ultrasonics

Appointment of *Dr. Walter Welkowitz* as director of engineering has been announced by *Vibro-Ceramics Div., Gulton Industries, Inc.* Dr. Welkowitz joined the company in 1955, and his current duties will include the direction of all engineering and research activities in the fields of industrial ultrasonics and medical-electronics instrumentation.

Prior to joining the firm, Dr. Welkowitz lectured on acoustics in the Graduate School of Engineering, Columbia University and conducted research in the University's Acoustics Laboratory. He received his basic indoctrination into the biological applications of ultrasonics as a graduate student and research associate at the University of Illinois. He received his B.S. degree from Cooper Union College in New York, and his M.S. and Ph.D. degrees from the University of Illinois in electrical engineering.

A member of the Acoustical Society of America and the Institute of Radio Engineers, Dr. Welkowitz has received

Dr. Walter Welkowitz

numerous scholastic honors including membership in Tau Beta Pi, Eta Kappa Nu, Sigma Xi, Pi Mu Epsilon and Phi Kappa Phi.

Volino Named Eastern Sales Manager for Maas & Waldstein

Don Volino has been appointed eastern division sales manager for the 82-year-old firm of *Maas & Waldstein*,

for the "Solution to your Plating Problems" .... come to JELCO

Get the Brightest Nickel ever — right out of the barrel!

BARREL NICKEL Brightener

Can be used in your present regular solution with standard equipment

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- BARREL NICKEL Brightener

- Maximum brightness — with minimum solution control
- Single addition agent
- For use in Hot or Cold solutions
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A Proven Process!
Used successfully by job platers and manufacturers
NON-CRITICAL
BOOSTS PRODUCTION
CUTS REJECTS

For technical information, complete details and prices ... write to

JELCO Finishing Equipment Corp.
153 East 26th Street, New York 10 • Phone LExington 2-3055

Don Volino

Newark, N. J., manufacturers of industrial product finishes.

Formerly with the General Electric Co., Mr. Volino brings many years of experience in application and use of lacquers, enamels and synthetics to his new post. As a member of RCA-Victor's Standardization Division, he was also responsible for standardizing finishes on RCA products.

Mr. Volino joined Maas & Waldstein in 1950 as technical sales representative. He is a member of both the American Electroplaters' Society and the American Ordnance Association.

New Infilco Office Addresses

Infilco Inc., of Tucson, Ariz., manufacturers of water, sewage and waste-treating equipment, has moved its San Francisco office to 1485 Bayshore Blvd., telephone JUniper 7-7852. *F. S. Howard* is in charge.

N. N. Cahan, until recently representative for the company in the New York district, has established an office in Syracuse. Address is P. O. Box 231, Syracuse 1, N. Y.

Infilco Elects W. M. Gross Vice President

Election of *W. M. Gross* to the position of vice-president has been announced by *Infilco, Inc.*, manufacturer of water, sewage and waste treating equipment. He will continue to have his headquarters in New York. Thus, in addition to the home office of the company in Tucson, officers of the company will be resident on both the east and west coasts.

W. M. Gross

Mr. Gross has been with the firm since 1934 and, prior to that time, was active in the water, sewage and waste treating fields.

Allied Research Announces New Officers, Directors and Operational Structure

Allied Research Products, Inc., has announced the following officers and

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THE IDEAL ADHESIVE

For Setting Up or Recoating Polishing Wheels, Abrasive Belts & Discs

Nuglu, a liquid glue, developed to lengthen wheel life — produce a better finish, and increase metal finishing production.

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A mixture of Nuglu and graded aluminum oxide grain —

Save on operating costs, increase production, reduce wheel inventories, and obtain greater results, with less costly materials, in fine polishing work!

Ask for information on The Siefen Finishing Systems

— Also for better metal finishing use Siefen Compositions • Stainless Steel • Bar (Grease) in Tube • Liquid Tripoli • Liquid Grease • Lapping Compound • Burring Compound.

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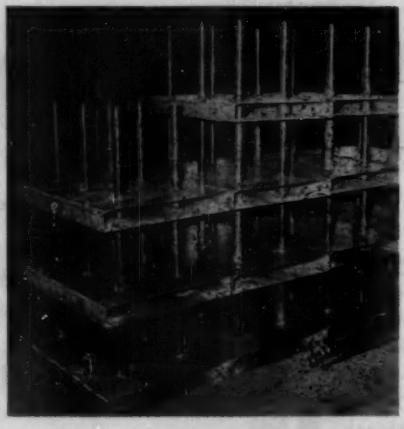
1927 Our Thirty-First Year 1958



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STORTS WELDING COMPANY INCORPORATED

38 Stone Street
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Manufacturers of Welded Fabrications to Specification

directors as a result of the merger with *Wagner Brothers* which occurred May 1, 1958.

Officers are: *H. C. Irvin*, president; *Jules Horelick*, vice-president; *Philip G. Richey*, vice-president and treasurer; *J. A. Cairns*, vice-president; *F. M. Mansfield*, vice-president; *Harry C. Quast*, secretary and *Joseph W. Agerson*, assistant secretary.

The operational structure includes *Joseph R. Wagner* as administrative assistant to Mr. Irvin and *Bruno Leonelli* as technical assistant. Mr. Cairns is in charge of sales, Mr. Mansfield in charge of marketing, Mr. Richey in charge of finance and Mr. Horelick in charge of development.

Sel-Rex Appoints Harper West Coast Representative

The appointment of *Paul Harper* as west coast representative has been announced by *Sel-Rex Corp.*, Nutley, N. J., manufacturers of metal finishing equipment and supplies.

A graduate chemical engineer, University of Missouri 1939, Mr. Harper has been active in the electroplating and metal finishing industries for nearly 20 years, having held such positions as: manager of plating division, Michigan Chrome and Chem. Co., Detroit; plant manager, Detroit Die Casting Co., Detroit; plant manager, Bart Mfg. Corp. (Atomic Energy sub-contract); and process engineer for Western Cartridge Co., Division of Olin-Mathieson Chem. Corp. During World War II, Mr. Harper was assigned by his employer, Chrysler Corp., Detroit, to the Manhattan Project, where he was concerned with the fabrication of diffusion equipment for the Atomic Energy installation in Oak Ridge, Tenn.

Paul Harper

Mr. Harper, who will make his headquarters in the Los Angeles area, may be reached at GRanite 7-4206 after August 15th. A permanent Los Angeles address is to be announced shortly.

In his new post, Mr. Harper will be responsible for sales and technical service in the states of California, Oregon, Washington, New Mexico, Nevada, Texas, Utah, Arizona and Colorado.

Narda Ultrasonics to Expand Production and Lab Facilities

Narda Ultrasonics Corp., Mineola, L. I., N. Y., has just acquired a modern spacious one-story, attractively landscaped building at 625 Main Street, Westbury, L. I., N. Y. The new facility will provide the company with 16,500 square feet of additional production space, and an equal amount of land for employee car parking.

Sales, administration, and other

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Trouble Free — Low Cost
Little Supervision Needed
Ready To Use — Just Add Water
Uniform Color — Can Match Colors

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TRUE BRITE CHEMICAL PRODUCTS CO.
BOX 31, OAKVILLE, CONN.

Non-Breakable • Sturdy

PPI POLYETHYLENE CONTAINERS...

TANKS ARE MOLDED IN ONE PIECE — WITHOUT SEAMS AND WITH INNER FLANGES FOR SUPPORT

PPI Containers will withstand most acids and alkalies at temperatures up to 160°F.

Tank Sizes and Prices

Stock No.	5-PT	15-PT	30-PT	55-PT
Capacity (gals)	5	15	30	55
Height	13¾"	20¾"	27"	33¼"
Outside Dia.	11"	14⅝"	18"	22¼"
Wall Thickness	1/16"	1/16"	3/32"	1/8"
Price Each	$7.50	$16.50	$31.75	$34.00

Cover Sizes and Prices

Stock No.	5-PTC	15-PTC	30-PTC	55-PTC
Size (gals)	5	15	30	55
Price Each	$3.50	$4.00	$4.50	$6.00

LIGHTWEIGHT • LONG LASTING • NON-BREAKABLE

POLYETHYLENE PAILS - IN PASTEL COLORS

MOLDED IN ONE PIECE FROM NATURAL POLYETHYLENE . . . with GALVANIZED BAIL

Pail Sizes and Prices

Stock No.	11-PP	14-PP	17-PP
Capacity (qts.)	11	14	17
Height	10¾"	11"	11⅞"
Diameter	10"	11"	12"
Price Each	$3.00	$3.30	$4.00

Covers Available for 11 qt. Pails ONLY
Cover Price 88c Ea.
Stock No. 11-PPC

PLACE YOUR ORDER TODAY!

Dependable PPI Products . . .
• PLATING RACKS • RUBBER DRUM LINERS • ACID CONTAINERS • ANODE HOOKS • FIBERGLAS TANKS, DUCTS & HOODS • PLASTIC COATED DIPPERS & PAILS • STEEL TANKS • STAINLESS STEEL TANKS • LEAD LINED TANKS • PLASTIC LINED TANKS • POLYETHYLENE PAILS & CONTAINERS • FUME SEPARATORS • PLATE COILS • LEAD ANODES • TRICHLOROETHYLENE • PERCHLOROETHYLENE • SILVER BRIGHTENER.

PLATING PRODUCTS, Inc.
1309 N. WASHINGTON
KOKOMO, INDIANA

management functions of the company will remain at the Herricks Road address. The Westbury plant will house all production and assembly operations, research and development laboratories, machine shops, the mechanical erection department, the customer applications laboratory, and the physical and chemical process division.

U. S. Rubber Appoints Dr. Wilson Manager of Research Center

Dr. Thomas L. Wilson has been appointed manager of the research center of *United States Rubber Co.* in Wayne, N. J. He replaces *Dr. Arthur E. Brooks*, who was recently appointed an assistant director of the research and development department. In his new assignment Dr. Wilson will manage the company's multi-million dollar research center opened last year in Wayne.

After obtaining a doctorate degree in chemistry from the University of Chicago, Dr. Wilson joined the company's general laboratories in 1935 as a research chemist. He was appointed head of the laboratory's information and patent department in 1947, in

Dr. Thomas L. Wilson

1954 was named administrative assistant to the director of research and development, the post he held before receiving his new assignment.

Pennsalt Moves Pittsburgh Office to Natrona, Pa.

Pennsalt Chemicals Corp.'s industrial chemicals regional office, formerly located in the Alcoa Bldg., Pittsburgh, will move into new quarters at Natrona, Pa., effective August 4. The move will coordinate sales activities with plant facilities at the site of the company's original plant on the Allegheny River 21 miles north of Pittsburgh.

Office quarters for the regional office have been remodeled in the move to provide better customer service by centering manufacturing, shipping and sales activities at a single location.

John C. Hampson, newly appointed regional manager, replacing *William P. Snelsire* who has retired, will be in charge of sales activities.

Coincident with the relocation of the office, the company announced that it will also move to Natrona the sales, research and development units of the Corrosion Engineering Products Department. The department's corrosion resistant products for the construction and industrial maintenance markets are currently manufactured at the Natrona plant.

Robert R. Pierce, recently named manager of the coordinated department in charge of sales, manufacturing

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ZIP-TIP
BUFFS

The radial segment construction of the Zip-Tip Buff permits it to perform equally well on flat or contoured surfaces. The cross-cutting movement of the spoke-shaped segments prevent work streaking while it breaks up straight-line patterns on the surface.

- Zip-Tips are available in a wide variety of all cloth constructions —also combinations of cloth and sisal.
- Zip-Tips are made of heavy-duty, bias-cut materials mounted on ventilated steel centers.
- Zip-Tips are extra thick and provide wider buff faces with greater compound retention capacity.
- Zip-Tips are perfectly balanced —require no raking.

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FORMAX MFG. CORP.
DETROIT 7, MICHIGAN
"THE FOUR McALEERS"

TWICE AS FAST!
Cut costs way down with Model 20 New Holland KREIDER Centrifugal DRYER

Does two operations at once . . . Air-dries as it Spin-dries! Double action assures moisture-free surfaces in less time . . . eliminates scoring and marring . . . saves—start to finish!

SPECIFICATIONS:

1-h.p. motor—220, 440, 550 volts—2 or 3 phase.	Quiet V-belt drive.	mum floor space.
Spins 75-lb. loads at 825 r.p.m.	Arc-welded steel plate construction.	Meets N.E.C. specs.
	Weight 490 lbs.	Auxiliary electric or steam heating units available as optional equipment.
	Requires mini-	

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NEW HOLLAND MACHINE COMPANY
NEW HOLLAND, PA.

and research and development; *James H. Cogshall*, recently appointed corrosion engineering products sales manager; and *Robert S. Mercer*, new manager of development will also move to Natrona address.

American Air Filter Announces Three Changes in Field Sales Force

Three changes in the field sales force have been announced by *American Air Filter Co. Joe P. Richardson*, formerly with the Air Filter Products Dept., in the firm's home office, has been transferred to the Minneapolis branch office. *Stanley D. Jensen*, sales engineer, has been added to the staff of the firm's Denver branch office.

Kenneth Hutchinson has joined *Albert L. Becker*, Albany, N. Y., as a sales engineer. Becker is the Albany representative for the firm's Herman Nelson unit ventilator products.

Kelite Appoints Weldon

Frank W. Weldon has been appointed district sales manager for *Kelite Corp.*, manufacturer of industrial chemicals for cleaning and metal finishing, and steam cleaning equipment. Prior to his appointment, Mr. Weldon served for 12 years with Oakite Products, Inc.

Frank W. Weldon

Mr. Weldon will be responsible for sales in the Dallas district, comprising northwestern Texas, Oklahoma, southern Kansas, southwestern Missouri, northern Arkanas, western Tennessee and Kentucky, and northern Mississippi. He will make his headquarters at the firm's Dallas, Texas facility.

John Lowe New Du Pont Industrial Finishes Manager in Atlanta

John E. Lowe, assistant industrial sales manager in the *Du Pont Company's* industrial finishes regional sales office in Chicago, has been transferred to Atlanta as regional industrial sales manager. He replaces *J. T. Geoghegan* who has joined *Du Pont of Canada*.

A graduate of Purdue University and a native Chicagoan, Mr. Lowe joined the company as a chemist in 1942. Following a brief period in the Explosive Department, he entered industrial finishes sales field in the Philadelphia region. Subsequently he was transferred to the Chicago region as representative in the Grand Rapids area, then made assistant industrial sales manager from which he advanced to his new post.

Techline is Name of New Wheelabrator Division

A new division of *Wheelabrator*

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Faster Cutting — Increased Production Economy

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FAST CUT — ALL PURPOSE —
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Roy T. Romine

Lee D. Stevens

Corp., Mishawaka, Ind., formed as the result of acquiring the former *Crandall Engineering and Mfg., Inc.*, of Vicksburg, Mich., will be known as the *Techline Division*. The new division, with headquarters at Vicksburg, will be responsible for the manufacture and sale of precision finishing equipment that includes barrel finishing machines and wet blast equipment. Complete experimental and demonstration laboratories also will be maintained in Vicksburg.

George H. Lieser, who has been department head of the line of wet blast equipment at the company for the last eight years, will be field sales manager of the new division; *Roy Romine*, who founded Crandall in 1957, will be chief engineer, and *Lee Stevens* will be director of process engineering.

Chainveyor Corp. Appoints Long

Announcement of the appointment of *Charles L. Long* to head the Project Engineering Department has been announced by *Chainveyor Corp.* He will

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MACARR
CURRENT
INTERRUPTER

MODEL CIAC

Interrupts voltage to main line starter of rectifier feeding current to plating tank, where interruption is desired. Capable of handling rectifiers with capacity ranges from 500 to 10,000 amps.

TYPE CIDC

Interrupts current using auxiliary DC switch of proper capacity for interruption at bus-bars. Models available from 250 to 1500 amps. DC:

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MODEL CIDC-500
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Olive drab for cadmium and zinc plate. Maximum protection for ordnance finishes.

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Brightens and passivates copper and brass. Non-fuming.

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Produces lustrous plate out of the tank or barrel.

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Brightens (barrel or still).

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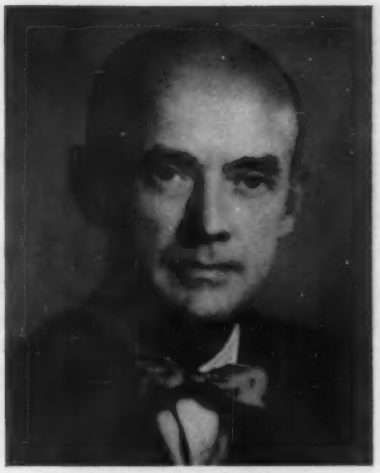
ELECTRO-FINISHING RESEARCH, INC.
140 LIBERTY ST. Ph.: HUbbard 7-8889 HACKENSACK, N. J.

Charles L. Long

Ampere Process Division Formed

Ampere Industries of Newark, N. J., manufacturer of all-radiant electric space heating equipment utilizing a quartz element has organized an Industrial Process Division. The new division will manufacture and market Amp-Quartz infra-red heating panels for industrial processing.

Associations and Societies



Robert C. Trees

AMERICAN ELECTROPLATERS' SOCIETY

R. C. Trees Publicity Chairman, Fifth Industrial Finishing Exposition

Robert C. Trees is presently director of advertising and sales promotion at *The Udylite Corp.*, Detroit, Mich. He has been associated with the firm for eighteen years. Previous to that time he was manager of a glass plant in Indiana and of a silverware company in Connecticut.

Mr. Trees is a graduate of Columbia University, with a B.Sc. degree.

make his headquarters at the general offices in Los Angeles, where he has been factory manager for the past two years.

Long started his career with the company in 1947 as production supervisor, and subsequently served as district manager with headquarters in Detroit.

Detroit Branch

Approximately one thousand electro-

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Rolled

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Acid Baths

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SINCE 1939

Producers of Rolled — Cast and Forged High Purity Anodes — Nickel — Copper — Zinc — Tin — Lead — Cadmium and Brass.

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Industry's Abrasive BONDING CEMENT for Wheels and Belts

SIZES AS WELL AS BONDS

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☐ Please send us literature giving full details.

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Company_____

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Some of the boys relaxing between activities.

Putt Luck tournament attracted great spectator interest.

platers attended the annual Stag Day. This year it was held on July 25 at the new, million dollar club house of the Hillcrest Country Club, Mt. Clemens, Mich.

Activities consisted of golf, baseball, bait casting, archery, horseshoes, putting, tug-o-war, and egg throwing. Everyone present received a door prize.

New York Branch

Chairman *Joseph Rembecki* has announced that plans are well under way for the annual banquet and technical session to be held February 7, 1959 at the Hotel Statler in New York City.

San Francisco Branch

The July meeting was held at the International Inn, South San Francisco. In attendance were 21 members and 13 guests. This was the best turn out for the 1958 year.

The speaker was *King Ruhly* of Michigan Chrome who gave a very instructive talk on "Masking and Stop-Off Problems." With Mr. Ruhly was the West Coast representative for Michigan Chrome, *Al Neeme*.

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Yes, but...no rack is too complicated for Davies to design and build. If you need a complicated rack, or the simplest hook, call

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Cutting efficiency and safety with a blade shaped to suit your needs. Try-out order! $1.00 for knife handle and sample blade assortment. Catalog of complete knife and blade line on request.
If you have any special requirements for cutting tools, call on us at once. Our half-century of specialized experience is at your disposal.

Handicraft Tools, INC.,
A division of X-acto, Inc.
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During the business session the following applicants were elected to membership. *Gerald Coleman, Murray Hart, James Hodges, Brian Kelly, Louis Larsen, Henri Henderson, F. F. Hutchinson.*

R. T. Coen
Secretary-Treasurer

NATIONAL ASS'N OF METAL FINISHERS

Glenn H. Friedt, Jr., vice president of United Platers, Inc., Detroit, was named general chairman of the 1959 convention committee of the NAMF. Serving with Mr. Friedt are *Webster B. Knight, Sr.,* president of Knight Plating Co., Detroit, who is the convention co-chairman, and *Edward N. Marlette,* president of Marlette Plating Co., Buffalo, educational chairman.

The 1959 NAMF conclave will be held in Detroit from June 14 to 16, with headquarters at the Hotel Statler. A general meeting of the membership, elections, committee meetings, a 2-day management seminar, and the traditional banquet will highlight the 3-day convention of job shop owners and operators.

General chairman Friedt is past president of the Detroit branch of the A.E.S.; past chairman and director of the NAMF affiliate in the Auto City, the Plating Institute of Michigan; and former director of the NAMF. He is a member of the Michigan Bar Association as well as other local, state and national bar groups.

FEDERATION OF PAINT AND VARNISH PRODUCTION CLUBS

The Paint Industries' Show of 1958, to be held in the Arena of the Cleveland Public Auditorium on October 6, 7, and 8, will be the biggest show in the 23-year history of the annual exhibit, which is held concurrently with the annual meeting of the *Federation of Paint and Varnish Production Clubs.*

One hundred and forty-nine exhibit spaces, accupied by 92 exhibitors, will bring to Federation member and guests the very latest developments in equipment and raw materials, the most recent technological information, and an opportunity to meet and talk to the technical personnel of suppliers.

The Joseph J. Mattiello Memorial Lecture will be presented by *Dr. Eugene G. Rochow,* Professor of Inorganic Chemistry at Harvard University. The keynote address will be presented by *Dr. Lincoln R. Thiesmeyer,* president of the Pulp & Paper Institute of Canada.

Panel discussions, technical papers, and a detailed report of the Federation's Paint Research Institute will round out the program. *Dr. J. Scott Long,* Director of the Institute, will explain its aims and objectives and the progress already made toward enlisting the services of outstanding scientists to study fields heretofore unexplored and to set up landmarks for the future development of products.

THE ELECTROCHEMICAL SOCIETY

The 114th Meeting of the Society will be held at the Chateau Laurier, in Ottawa, Canada, Sunday through Thursday, September 28 to October 2, 1958. Technical Sessions will be conducted by the Battery, Corrosion, Electrodeposition, Electronics (Semiconductors), Electro-Organic, Electrothermics and Metallurgay, and Theoretical Electrochemistry Divisions.

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up to 14 to 1
SURETY SURESEAL
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What a combination to beat the high cost of safety and service. Turn-Cuffs keep dangerous liquids away from arms and inside of gloves and Sureseal withstands more chemicals, oils, acids and solvents than any material we know. Top jobbers stock them or we will arrange a use test at our expense —write today.
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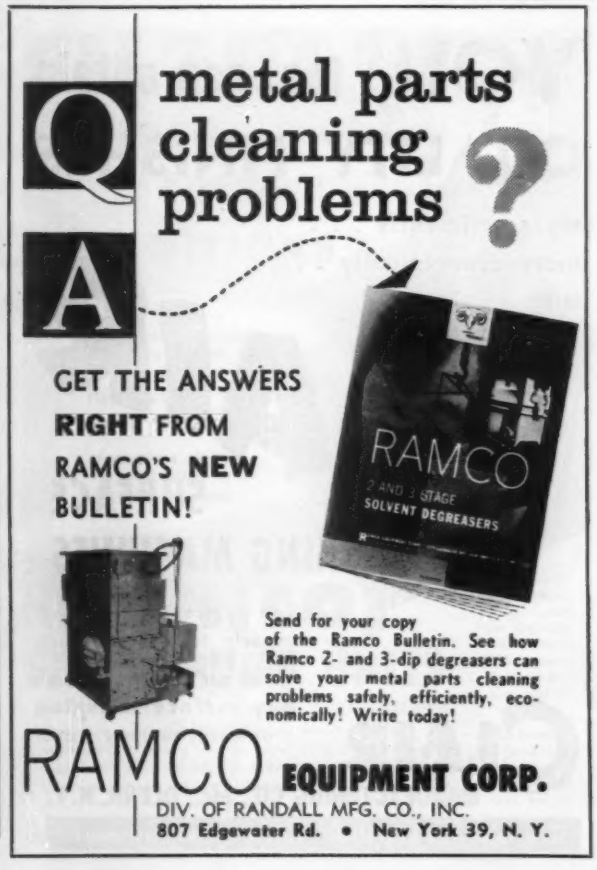
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SOLVENT DEGREASERS
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News from California

By Fred A. Herr

Pacific Enameling & Plating Co., 4301 Valley Blvd., Los Angeles, has completed a $150,000 expansion program which substantially increased the firm's job plating and enameling range. Among new equipment installed is a new enameling unit for work on stove parts, chair tops, and a wide variety of other items which the company processes on a job shop basis. A new electrostatic disc has been installed for uniform application on enamel. The expansion of plating facilities involved the installation of 20 new tanks, each 4 x 12 feet in size, for copper, chromium, cadmium, bronze, and zinc work. New 2,500 and 5,000 rectifiers provide the shop a total of 175 kva.

Glen Beckwith, vice president and supervisor of plating and enameling, reported that the new facilities also include an overhead crane with 12 foot work bars, instead of individual plating racks, with which the parts are carried from tank to tank.

Hughes Aircraft Co. of Culver City, Calif., reports the addition to its technical staff of *Dr. Joseph M. Denney*, a solid state physicist and metallurgist, who had served as metallurgist for Aeronautics Systems, Inc., of Glendale, Calif., for the past two years.

Kwikset Locks, Inc., Anaheim, Calif., has been dissolved as a separate corporation and will from now on be operated as the Kwikset Division of the American Hardware Corp. *Roy Bolkt*, vice-president, announced that no changes in management or operational policy are contemplated and Kwikset products will continue to be made and distributed under the same trade name.

The Department of Correspondences Instruction of the University of California, Berkeley, is offering a new course covering the basic fundamentals and latest developments in the technology of the plastics industry.

A comprehensive survey of both thermosetting and thermoplastic resins is offered. Emphasis is placed in the course on the applications of plastics, as well as on their physical, electrical, and chemical properties, on equipment and the latest molding techniques. The source also describes specialized processes, such as reinforced laminates, printed circuitry, potting, and encapsulation.

A two-volume syllabus, "Survey of Plastics," is supplied to students. It contains information on the industry, the properties of plastics, their production, manufacturing and finishing.

Author and instructor of the course is *Carl S. Seybold, Jr.*, a plastic consultant with the Radioplane Division of Northrup Aircraft, and instructor for the engineering extension division at U. C. L. A.

A precision color matching machine is employed by Anadite, Inc., South Gate, Calif., in anodizing pink gold aluminum accessories for the luxury cabins of United Airlines DC-8 planes.

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more efficiently . . .
more economically . . .
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SURFACE FINISHING MACHINES

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P-42

The cabins of the planes are fitted with aluminum anodized pink gold panels, seat trim, ash trays and other hardware parts, as well as some parts finished in white gold. Color matching is accomplished with the machine under absolute daylight and twilight conditions. Since each part must be matched individually for color perfection, rigid quality control methods are required in pink gold anodizing each part. The firm operates a battery of 18 tanks for this phase of its work.

Convair, Inc., Pomona, Calif., airplane manufacturers, reports the development of a ceramic coating for magnesium-thorium alloy which is said to have solved the problem of reducing missile weights.

The ceramic coating, it is reported, was developed as a joint research project of Convair and the Bettinger Corp. of Waltham, Mass. With the application of the new ceramic coating specially developed by Bettinger, the tensile strength of magnesium-thorium used in missiles is said to be materially improved, and abrasion, corrosion and erosion resistance of the alloy is increased. Ceramic coatings of 0.001 to 0.002" in thickness are being tested for missile application as part of the research and development project.

A six-point "scale of suitability" for various coatings for various types of fasteners has been developed by the Russell, Burdsall & Ward Bolt & Nut Co. of Los Angeles. The scale is reported to be based on the company's past experiences in metal finishing thousands of fasteners with different types of coatings.

The conclusions arrived at are: That hot galvanizing provides the coating with greater endurance under most conditions, but is not the best for highly pre-stressed fasteners, such as high tensile bolts. Electrodeposited zinc is the most practical coating next to hot galvanized. Cadmium plate endures satisfactorily in salt atmospheres, but is unsuitable for such items as kitchen appliances. Rust preventive characteristics of black oxide coatings are satisfactory for general applications. Phosphate coatings offer limited protection but provide a good base for paint. Chromium plating should be regarded more for its appearance than for protection.

The Eleventh Western Metal Exposition and Congress of the American Society for Metals will be held in Los Angeles, Calif., March 16 to 20, 1959, according to an announcement by *Ray T. Bayless*, the Society's assistant secretary. The exposition will be held in the Los Angeles Pan Pacific Auditorium and special tent annexes; and the technical sessions in the Ambassador Hotel.

Chester L. Wells, Cleveland, O., assistant director of the show, reports that the 1959 Show will present many new, improved and helpful materials and equipment to aid western industry in producing more at less cost. As in the past, new developments will be explained and demonstrated by metallurgists and metal engineers.

New equipment constituting a complete new electrolytic tinning line underwent final installation at the Kaiser Co.'s Fontana, Calif., steel mill in June, increasing tinplate capacity from 200,000 tons per year to 370,000 tons. The

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new facilities are part of a $214 million expansion program at the Fontana plant. More than 350,000 sq. ft. of floor space have been added for use by four major units for the production of electrolytic tinplate. Included are a new electrolytic pickling line, a new continuous annealer, new temper mill and new electrolytic tinning line. This latter line supplements a 100-foot electrolytic tinning line which has been in operation for the past five years.

The new annealing facilities are reported to represent the west's first continuous annealer, a modern, complex system of equipment which cleans and softens steel in a continuous operation as a preparatory step in the manufacture of tinplate. The massive annealing installation rises higher than a nine story building.

Much of the Fontana plant's output of electrolytic tinplate is absorbed by the western canning industry. The process used at Fontana permits precise control over the amount of tin deposited on each side of the strip steel.

Dedication ceremonies, followed by an open house party, marked the dedication recently of the Titan Metal Manufacturing Company's new brass mill at Newport, Calif. Directors and officers of the Chicago-based company attended in the persons of *Chester D. Tripp*, board chairman, Chicago; and *William W. Sieg*, president. Output of the $3,000,000 plant ultimately is expected to exceed 25 million pounds of brass and bronze products annually.

OBITUARIES

KENNETH C. BROWNELL

Kenneth Cooke Brownell, 55, chairman of the board of *American Smelting and Refining Co.* and a leading United States industrialist, died Aug. 4, at Columbia Presbyterian Medical Center.

Mr. Brownell was born in Everett, Wash., the son of *Francis H.* and *Josephine Noble Brownell*. He attended the Taft School at Watertown, Conn., and the Thacher School in Ojai, California. He graduated from Yale University in 1925 and attended the Graduate School of Business Administration at Harvard University.

He joined the company in 1927 and came up through the ore purchasing and sales departments to vice-president in 1936, executive vice president in 1947 and president in 1949. He was elected board chairman and chief executive officer in April, 1957.

He is survived by his wife, the former *Elizabeth Hyde* of Greenwich; two sons, *Kenneth Hyde Brownell* and *Jonathan Noble Brownell*, both of Greenwich; and a daughter, *Ann Brownell Thomas* of Schenectady, New York. His mother, who makes her home in New York City, and a brother, *Francis H. Brownell, Jr.*, of Seattle, Wash., also survive.

LEE M. PORTER

Lee M. Porter, Boston regional trade sales manager of the *Du Pont Co.'s Finishes Division*, died Aug. 5 at his home in Wellesley, Mass. He was 50 years old.

Mr. Porter, a native of Nova Scotia, joined the company in 1935 as a paint salesman in Portland, Me. He was promoted to trade sales supervisor in 1948, and had been Boston regional trade sales manager since 1954.

Mr. Porter is survived by his wife, *Mrs. Eve Porter*.

Manufacturers' Literature

Complete Process Automation

Abbey Process Automation, Inc., Dept. MF, 37-01 48th Ave., Long Island City 1, N. Y.

Twelve-page illustrated Bulletin 101, gives complete information on the development of a new process automation system known as Abbey-Matic.

An explanation is given of why a whole new method of automation was

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needed, and the five basic principles that make true automation possible with this system are outlined. The advantages of the system are then listed, and the mechanical features. Details are also given on operation of automation controls, transfer frequency and loading frequency, cycle selection, accumulation and dispatching, rapid transfer, control action, and special features.

Barrel Plating Equipment

The Udylite Corp., Dept. MF, Detroit 11, Mich.

A twelve page, illustrated brochure is now available on the above firm's barrel plating equipment. Information is given on cylinders, barrels, loading stands, storage and transfer units, dryers, coils and rectifiers.

Vacuum Metalizing Coatings

Bee Chem. Co., Dept. MF, 12933 So. Stony Island Ave., Chicago 33, Ill.

A 16-page brochure titled "Vacuum Metalizing Coatings for Metal, Glass & Thermosetting Plastics" has just been published. Various coating application procedures as well as the coatings used in conjunction with vacuum metalizing are described.

Color Anodizing

Hanson - Van Winkle - Munning Co., Dept. MF, Matawan, N. J.

How one machine anodizes automobile parts many different colors is described in an illustrated four-page leaflet, which tells how Firestone Steel Products Co. finishes grilles and body trim for 1958 Fords at Akron, O., using a new automatic anodizing machine.

A schematic drawing in two colors shows arrangement of treatment tanks in full detail, with tank design data listed in the legend. Text tells how racks are individually keyed so that work loads being treated simultaneously can be moved through varied cycles. Leaflet explains how this principle can be used to effect dollar savings in complex, volume production operations. Details of chemistry and mechanics are given.

Five photographs illustrate the machine as a whole, loading, the rack keying mechanism in operation, warm rinsing, and solution agitation.

Printed Circuits Plating

Sel-Rex Corp., Dept. MF, Nutley 10, N. J.

Solutions to the problem of the failure in service of plated printed circuits, are offered in a 4-page article.

Starting with the specific application and intended service of the printed circuit, the article recommends ways and means to improve in-service reliability through latest developments in printed circuits plating technology. The precious metals, and various base metals, are covered in detail with their advantages and disadvantages for specific applications. Some of the problems discussed, and to which practical solutions are offered, include: lifting or peeling of the copper foil after the circuit has been placed in service; deformation of the di-electric base ma-

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terial; softening of the adhesive or resin binder between copper foil and laminate; and lifting of the electroplated foil due to high tensile stresses.

A table gives recommended thicknesses of electroplate of various base and precious metals, predicated by the application of the printed circuit.

Porcelain Enameling

Frit Div., Ferro Corporation, Dept. MF, 4150 East 56 St., Cleveland, Ohio.

A new edition of the 113-page book, "Porcelain Enameling Operations," by E. E. Bryant, technical director of the company's Frit Division, is now available.

Gravity Conveyor

Rapids-Standard Co., Inc., Dept. MF, 342 Rapistan Bldg., Grand Rapids 2, Mich.

Bulletin RW-58 deals with various applications to which gravity wheel conveyors have been adapted. Making use of pictures, drawings, diagrams and specification tables, the 16 page bulletin deals with selection of conveyors, construction features and accessories which are available for conveyor adaptations.

Heat Exchangers

The Trane Co., Dept. MF, La Crosse, Wis.

A cover-to-cover revision of the Fluid Cooler (Air Cooled Heat Exchanger) sales catalog has just been completed. Because of the specialized uses of the air-cooled heat exchanger line, approximately one-third of the catalog is devoted to the types of units normally used in various industrial and process cooling applications.

Two basic models — vertical or horizontal air flow — and 23 sizes are covered in the catalog. Also, information is included on equipment which may be specified to operate on a forced or induced draft arrangement. Additional information includes condensed equipment capacity and dimension tables, and descriptions of the basic components and accessories.

Maintenance Painting Units

Eclipse Air Brush Co., Dept. MF, 390 Park Ave., Newark 7, N. J.

This literature describes six complete maintenance units ready to paint, from a unit ideal for touch-up and small jobs to a three man unit for maximum production from medium speed guns.

Infra-Red Oven Sections

Lighting Div., Safety Industries, Inc., Dept. MF, P. O. Box 70, Milford, Conn.

Infra-Red oven sections of the R-130 series, which can be assembled to meet batch-type requirements for baking, drying and product heating, mounted in contoured combinations for continuous conveyor-line applications, or purchased as complete portable ovens, are described in a new folder. Copies of this folder, Form 4999, include descriptive literature, outline and mounting dimensions, detailed application data, and prices.

Barrel Finishing Media

Dixon Sintaloy Inc., Dept. MF, 535 Hope St., Stamford, Conn.

An illustrated, two-color announcement bulletin and accompanying data sheets are now available covering an entirely new type of sintered metal tumbling media.

The technical data includes information on the application of standard Sintaloy ferrous, non-ferrous and impregnated media types for wet and dry grinding, deburring, and burnishing a wide range of metallic and plastic part materials.

Phosphating Analysis

Turco Products, Inc., Dept. MF, 6135 So. Central Ave., Los Angeles 1, Calif.

A phosphating analysis kit enables metalworking manufacturers to determine whether their products are adaptable to phosphating and to the many paint adhesion advantages it offers. The kit is offered free of charge to any manufacturer in the metalworking field, whether or not he is currently phosphating.

Roller Conveyors

Rapids-Standard Co., Inc. Dept. MF, 342 Rapistan Bldg., Grand Rapids 2, Mich.

An informative, 12-page bulletin, RR-58, on gravity conveyors, is packed with illustrations, charts and diagrams.

The bulletin contains typical applications, construction features, tells how to select gravity roller conveyors, includes a section on steel and aluminum conveyor and presents conveyor accessories.

Specifications, weights and capacities are presented in easy-to-read charts and tables and factors to consider in installation are explained fully.

Fans & Blowers

Chicago Blower Corp., Dept. MF, 9867 Pacific Ave., Franklin Park, Ill.

A new bulletin describes a complete line of centrifugal, general ventilation, exhauster and axial airfoil fans, turbo pressure blowers, induced draft fans and roof ventilators.

The illustrated 4-page folder de-

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scribes the products and their application and contains a chart showing size and capacity of each of the various fans and blowers.

Rotary Blowers

Roots-Connersville Blower Div., Dresser Industries Inc., Dept. MF, 900 West Mount St., Connersville, Ind.

A new compact design for rotary positive blowers is presented in a new bulletin just issued.

Organic Specialties

Chemical Development Corp., Dept. MF, Danvers, Mass.

The above firm has issued a twelve page general plastics booklet which lists many of its products and gives a brief description of each. Included in the booklet is information on molds, adhesives, anti-static agents, mold releases, strippable coatings, spray masks, frosting lacquers, dip polishes, fiber lubricants, cementing fixtures, cleaners, and custom specialties.

Aluminum Finishing

Engineering Products & Specialties, Inc., Dept. MF, Dunnell Lane, Pawtucket, R. I.

A new brochure, "The Finishing Touch," is of special interest to all industries that manufacture products in which aluminum is used as either a decoration or functional part. The services described range from the preanodizing mechanical preparation of aluminum on to highly specialized and intricate processes.

Corrosion-Resistant Materials

American Agile Corp., Dept. MF, P.O. Box 168, Bedford, Ohio.

A new, four-page condensed catalog, details a complete line of corrosion-resistant fabrications and coatings, components, semi-finished materials, fabricating equipment, and laboratory ware.

The free literature contains more than 30 illustrations together with detailed specifications, design and operating features, and application information. All product types are conveniently classified for maximum ease of reference.

Paint Color Chart

Carter Paint Co., Dept. MF, Liberty, Ind.

A free color chart shows 36 colors of a new multi-purpose maintenance and product paint for metal, wood and masonry.

The chart also shows Armorize primers and one-coat primer-finish for a variety of maintenance and product uses.

Dehumidification

Abbeon Supply Co., Dept. MF, 179-15 Jamaica Ave., Jamaica 32, N. Y.

Bulletin #512 shows the latest equipment used to measure humidity and to dehumidify various sized areas. It is based on experience in equipping many thousands installations.

Hard Aluminum Anodizing

Accurate Anodizing Corp., Dept. MF, 4506 Roosevelt Road, Chicago 24, Ill.

Poracc, an improved process for hard coat anodizing of aluminum is described in a bulletin just released.

Barrel Finishing

Lord Chemical Corp., Dept. MF, 2068 South Queen St., York, Pa.

Eight-page, 2-color, letterhead-size bulletin No. 158 describes the full line of "Lorco" equipment for precision barrel finishing. This includes conventional horizontal octagonal barrels in capacities ranging from 0.7 to 36.6 cubic feet and the new vibrator in capacities of 12.70 and 17.50 cubic feet.

Other equipment described and pictured in the new catalog includes a mechanized screen to separate work and chips or regrade chip sizes, chip bins, hoist pans, centrifugal dryers, vapor degreasers and a triple-action, tilting polygonal barrel. The new booklet also gives information on sample processing and field engineering service that is offered without charge.

Buffing and Polishing Machinery

Divine Bros. Co., Dept. MF, Seward Ave., Utica, N. Y.

A four-page brochure describes "job-engineered" buffing and polishing machinery. The booklet contains a representative list of custom engineered finishing machines. Some are relatively simple in design, while others are extremely complex.

Ball Bearing Trolleys

Link-Belt Co., Dept. MF, Prudential Plaza, Chicago 1, Ill.

Ball bearing trolleys and how they work in maintaining the efficiency of trolley conveyors are described in detail in a new book. Book 2636 contains 20 pages of specific data on the types and sizes of trolleys available; selection of new trolleys and attachments; and the replacement of units in existing installations. It also includes application and maintenance information along with data on trolley wheels, rollers for roller turns and special types of trolleys which are available for electrified and heavy duty foundry applications.

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4—#101 Tandum 15 H.P.
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2—Production Machine #484-2.
2—L'Hommedieu 5 H.P. variable speed.
10—Holland 5 H.P.
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5—Holland 7½ H.P.
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2—Barrett centrifugal dryers.
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200	7½	Hobart
300	7½	Hobart
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400	6	H-V-W
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1500/750	6/12	H-V-W
1500	15	Star
1500	30/50	Century
1500	40/65	G. E.
1500	65	Westinghouse
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Lasalco, Inc. 25
2820-38 Lasalle St., St. Louis 4, Mo.
Lea Mfg. Co. 88A
16 Cherry Ave., Waterbury 20, Conn.
Lea Michigan, Inc. 111
14066 Stansbury Ave., Detroit 27, Mich.
Lea-Ronal, Inc. 88B
139-20 109th Ave., Jamaica 35, N. Y.
Lewis Welding & Engineering Corp.
106 Northfield Rd., Bedford, Ohio
L'Hommedieu & Sons Co., Chas. F. 5
4521 Ogden Ave., Chicago, Ill.
Lindale Equipment & Supply Corp. 120
504 Smith St., Brooklyn 31, N. Y.
Macarr, Inc. 110
2543 Boston Rd., Bronx 67, N. Y.
MacDermid, Inc. Back Cover
Waterbury 20, Conn.
Magnuson Products, Inc.
50 Court St., Brooklyn 1, N. Y.
Manhattan Rubber Div., Raybestos-Manhattan, Inc. 101
6 Willett St., Passaic, N. J.
Meaker Company, The 32
1629 S. 55th Ave., Chicago 50, Ill.
Mearl Corp., The
124 E. 40th St., New York 16, N. Y.
Metal & Thermit Corp. 7, 44
Rahway, N. J.
Michigan Chrome & Chemical Co.
8615 Grinnell Ave., Detroit 13, Mich.
Miller Corp., Harry
4th & Bristol Sts., Philadelphia 40, Pa.
Mitchell-Bradford Chemical Co.
Wampus Lane, Milford, Conn.
Motor Repair & Mfg. Co., The 122
1555 Hamilton Ave., Cleveland 14, Ohio
Murray-Way Corp. 39
P. O. Box 180, Maple Rd. E., Birmingham, Mich.
Nerda Ultrasonics Corp., The
160 Herricks Rd., Mineola, L. I., N. Y.
National Polymer Products, Inc. 24
Reading, Pa.
Nazar Rubber Co., The 116
2727 Avondale, Toledo 7, Ohio
New Holland Machine Co. 108
New Holland, Pa.
Northwest Chemical Co.
9310 Roselawn Ave., Detroit 4, Mich.
Norton Co.
1 New Bond St., Worcester 6, Mass.
Oakite Products, Inc. 4
18 Rector St., New York 6, N. Y.
Octagon Process Inc.
15 Bank St., Staten Island, N. Y.
Packer Machine Co. 99
456 Center St., Meriden, Conn.
Park Chemical Co.
8074 Military Ave., Detroit 4, Mich.
Pennsalt Chemicals Corp. 102, 103
3 Penn Center Plaza, Philadelphia 2, Pa.
Pesco Plating Equipment Corp. 121
75 Wythe Ave., Brooklyn 11, N. Y.
Pfizer & Co., Inc., Chas. 27
630 Flushing Ave., Brooklyn 6, N. Y.
Phelps Dodge Refining Corp.
300 Park Ave., New York 22, N. Y.
Plating Products, Inc. 107
1509 N. Washington, Kokomo, Ind.
Potter Paint Co., Inc.
21 Crawford St., Cortland, N. Y.
Promat Div., Poor & Co.
851 S. Market St., Waukegan, Ill.
Quartz Radiation Corp.
54 Summer Ave., Newark, N. J.
Ramco Equipment Corp. 113
807 Edgewater Rd., New York 39, N. Y.
Randolph Products Co.
92 N. 12th St., Carlstadt, N. J.
Rapid Electric Co. 11
2881 Middletown Rd., Bronx 61, N. Y.
Raybestos-Manhattan, Inc. Manhattan Rubber Div. 101
Passaic, N. J.
Reynolds Chemical Products Co.
1200 N. Main St., Ann Arbor, Mich.
Robertshaw Fulton Controls Co., Fulton Sylphon Div.
Knoxville 1, Tenn.
Rona Laboratories, Inc.
E. 21st & E. 22nd Sts., Bayonne 3, N. J.
Sabin Metal Corp.
310 Meserole St., Brooklyn 6, N. Y.
Sandoz, Inc. 85
61 Van Dam St., New York 13, N. Y.
Saran Lined Pipe Co. 23
2415 Burdette Ave., Ferndale 20, Mich.
Schori Process Div., FerroCo Corp. 34
8-11 43rd Rd., Long Island City, N. Y.
Sel-Rex Corp. Inside Back Cover
75 River Rd., Nutley 10, N. J.
Service Screw Products Co.
131 N. Green St., Chicago 7, Ill.
Sethco Mfg. Co. 115
2286 Babylon Turnpike, Merrick, L. I., N. Y.
Siefen Co., J. J. 106
5643 Lauderdale, Detroit 9, Mich.
Simonds Abrasive Co.
Tacony & Fraley Sts., Philadelphia 37, Pa.
Solbern Mfg. Corp.
120 13th St., Brooklyn 15, N. Y.
Solvay Process Div., Allied Chemical Corp. 37
61 Broadway, New York 6, N. Y.
Solvents Recovery Service
1025 Broad St., Newark 2, N. J.
Sommers Bros. Mfg. Co. 119
3439 No. Broadway, St. Louis 7, Mo.
Spee Flo Mfg. Corp.
6614 Harrisburg, Houston 11, Texas
Stevens, Inc., Frederic B. 16
1808 - 18th St., Detroit 16, Mich.
Stokes Corp., F. J. 83
5500 Tabor Rd., Philadelphia 20, Pa.
Storts Welding Co., Inc. 106
38 Stone St., Meriden, Conn.
Stutz Co., The 84
4430 W. Carroll Ave., Chicago 24, Ill.
Surety Rubber Co. 113
Carrollton, Ohio
Syntron Co. 91
Homer City, Pa.
Technic, Inc. 43
39 Snow St., Providence, R. I.
Timesavers, Inc.
Box 7446, Robinsdale Station, Minneapolis 22, Minn.
Tramer Co., The Gilbert
1217 Main Ave., Cleveland 13, Ohio
Tranter Mfg., Inc. 10
Lansing 9, Mich.
Trerice Co., The H. O.
1424 W. Lafayette Blvd., Detroit 16, Mich.
True Brite Chemical Products Co. 107
P. O. Box 31, Oakville, Conn.
Udylite Corp., The 36, 41
Detroit 11, Mich.
Unit Process Assemblies, Inc. 117
61 East 4th St., New York 3, N. Y.
U. S. Galvanizing & Plating Equipment Corp. 42
31 Heyward St., Brooklyn 11, N. Y.
U. S. Stoneware 88
Akron 9, Ohio
Univertical Foundry & Machine Co. 111
14841 Meyers Rd., Detroit 27, Mich.
Victor Chemical Works 18, 19
155 No. Wacker Dr., Chicago 6, Ill.
Worklon, Inc. 90
253 W. 28th St., New York, N. Y.
Worthy Products Co. 122
Box 123, Temple, Pa.
Wyandotte Chemicals Corp. 17
Wyandotte, Mich.
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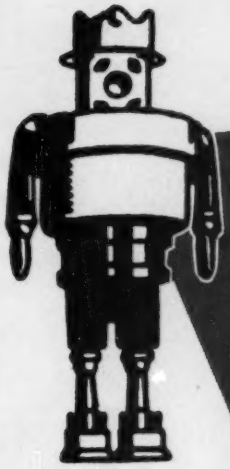

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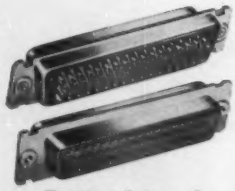

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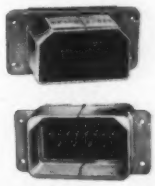

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